ENVIRONMENTAL ASSESSMENT
AND
FINDING OF NO SIGNIFICANT IMPACT
NAVIGATION IMPROVEMENTS
PORT LIONS, ALASKA

July 2005

FINDING OF NO SIGNIFICANT IMPACT

In accordance with the National Environmental Policy Act of 1969, as amended, the U.S. Army Engineer District, Alaska, has assessed the environmental impacts of the following action:

Harbor Improvements
Port Lions, Alaska

The project will construct a 1,360-foot-long detached rubblemound breakwater southwest and east of the basin, a 40-foot-long extension of the existing breakwater to the west, and a 75-foot-long extension of the stub breakwater. The existing mooring basin will remain unchanged. The southwest portion of the new rubblemound breakwater will replace the existing floating breakwaters which will be removed. No dredging is required.

The project was evaluated for environmental and engineering feasibility as well as consistency with pertinent environmental laws and regulations.

Environmental Considerations. The action was evaluated for its effects on several significant resources: water quality, benthic invertebrates, eelgrass, fish, waterfowl, and marine mammals. A breach between the toe of the breakwater and the shore on either side of the harbor is designed to benefit near-shore fish passage. Breakwater construction will be timed to avoid the juvenile salmon out-migration period of March 15 through June 15. Sediment curtains will be used, if necessary, to control water turbidity during construction to maintain Alaska water quality standards. Harbor lighting will be shielded to minimize bird strikes. No threatened or endangered species or cultural resources will be affected by the project. Essential fish habitat will not be significantly affected.

Consistency with Laws and Regulations. The environmental assessment documents compliance with the National Historic Preservation Act, the Endangered Species Act of 1973, the Magnuson-Stevens Fishery Conservation and Management Act to protect essential fish habitat, the Clean Water Act of 1977, and other applicable laws and regulations. The project is consistent with the Coastal Zone Management Program plan for the area.

The environmental review process has indicated that the project does not constitute a major Federal action significantly affecting the quality of the human environment. Therefore, an environmental impact statement will not be prepared for Harbor Improvements, Port Lions, Alaska.

Timothy J. Gallagher
Colonel, Corps of Engineers
District Engineer

26 Sep '05
Date

Navigation Improvements
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1.0 PURPOSE AND NEED OF THE PROPOSED ACTION

1.1 Background

Port Lions is in Settler Cove, Kodiak Island, Alaska. The village of Port Lions is about 30 air miles northwest of the city of Kodiak. Settler Cove is an arm of Kizhuyak Bay on the northern coast of Kodiak Island (figure 1).

In 1977 a final environmental impact statement (EIS) Port Lions, Alaska, was completed for the small boat harbor, and the project was authorized for construction in December of that year. The authorized project consisted of placing two rubblemound breakwaters (500 and 650 feet long) in Settler Cove. The entrance channel and basin are naturally deep and would not require dredging. The two breakwaters would have constricted a significant width of Settler Cove (Corps of Engineers 1977).

In 1978 a supplement to the final EIS was published to revise the project because the authorized project's high costs prevented the local sponsor and the State of Alaska from participating. The revised project, as described in the 1978 supplemental EIS, included a 600-foot-long breakwater detached from shore (the same alignment as the northern breakwater previously authorized) and a 170-foot-long stub breakwater attached to shore. This project was constructed in July 1981. The breakwater received extensive damage from storm waves during the week of November 9-12, 1981. The seaward side of the main breakwater was eroded, with displacement of armor and secondary stone occurring along approximately 450 feet of the breakwater.

In 1982, the main breakwater was repaired and lengthened 125 feet by the Corps of Engineers to increase storm wave protection. Entrance channel dredging, amounting to 5,000 cubic yards (yd^3), was required to accommodate navigation around the new breakwater. The dredged material, composed of sand and silt, was disposed of on the north side of the breakwater. Additional slope protection of the parking area reduced the opening between the main breakwater and the stub breakwater from 80 feet to 50 feet.

1.2 Purpose and Need of the Action

The primary problem is the existing breakwater does not provide adequate wave protection for the existing inner harbor facilities and moored vessels. The mooring basin is subject to severe damage from northeast waves entering the basin through the breach and around the deep-water end of the main breakwater. Damages are also caused by smaller, locally generated waves from the southwest. Year-round moorage has been reduced from 124 vessels to 35 vessels. The proposed action would increase storm-wave protection from the northeast and southwest for the existing harbor, and restore full moorage capacity of the harbor. It would also provide transient moorage for vessels waiting out storms or that are between fishing periods.

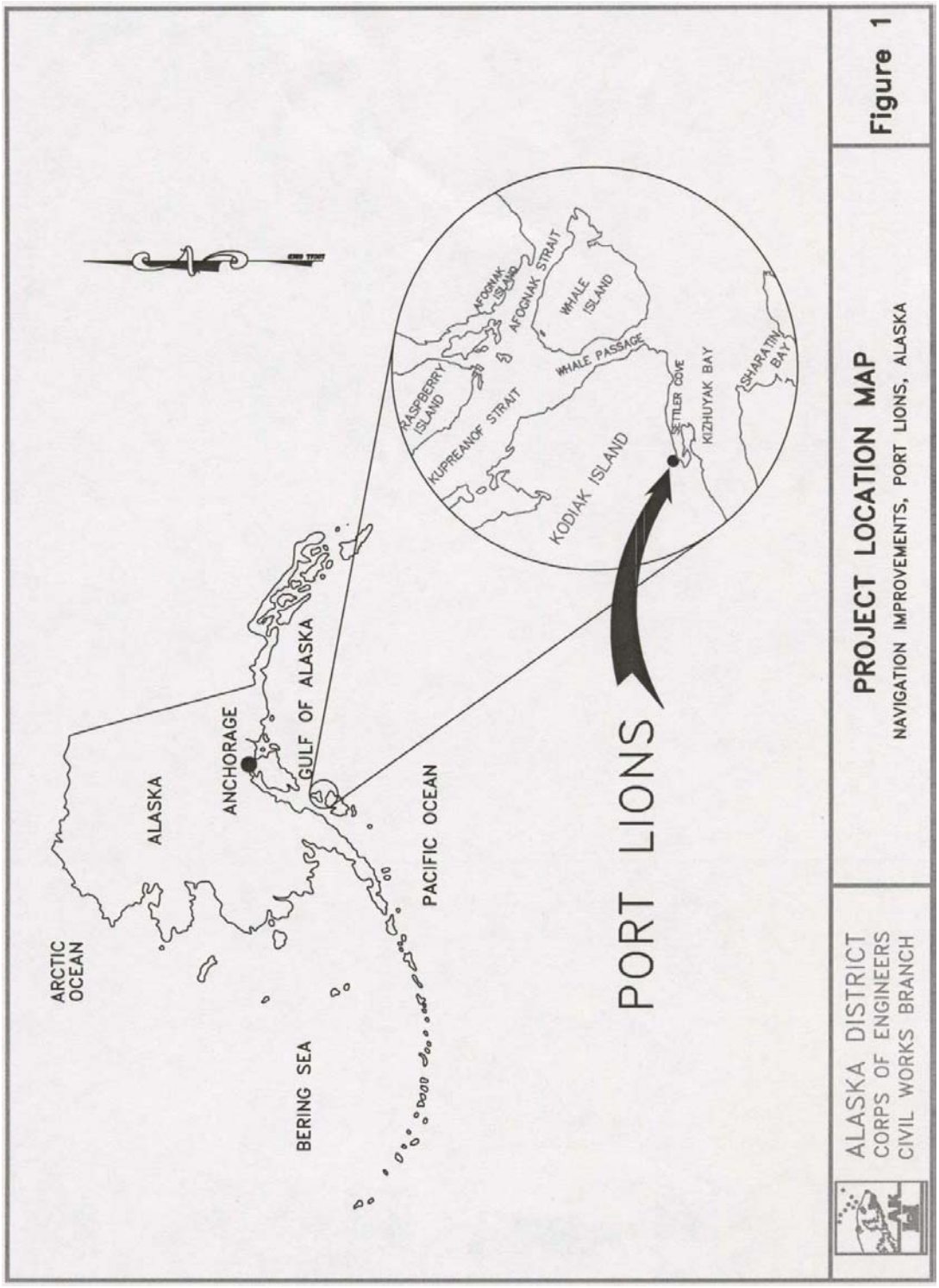

Figure 1. Location and Vicinity Map

2.0 ALTERNATIVES

2.1 Floating Breakwater and Wave Barrier Design Considerations

Floating breakwaters reduce wave action by reflecting the incident wave and by dissipating some of the wave energy through friction and turbulence. Wave barriers reduce waves more by reflection than by turbulence. Some of the wave energy passes through both floating breakwaters and wave barriers, resulting in a transmitted wave.

The transmitted wave is greatly affected by the width of the floating breakwater compared with the wavelength of the wave, and the draft of the breakwater compared with the depth of water.

For this project, floating breakwater and wave barrier design concepts were considered. At the existing harbor site in Settler Cove, design wave heights and periods for waves from the northeast exceeded the criteria for economically viable floating breakwater applications. Costs associated with very wide and deep-draft floating structures preclude use of such designs. The wave barrier design concept also has limitations in economically reducing wave energy to acceptable levels. The high cost of construction due to shallow bedrock sub-bottom conditions is the main factor that makes the wave barrier design inappropriate for this site.

Floating breakwaters would be effective as wave protection for waves from the southwest. Wave heights and periods are within the range where such designs are applicable. Water depths allow use of floating breakwaters with bottom anchors or piles for positioning. Bottom anchors would very likely be more cost effective than piles due to shallow bedrock.

2.2 Alternatives Considered in Detail

2.2.1 General

A wide range of alternatives was considered for navigation improvements at Port Lions. A matrix of possible alternatives for consideration was developed in the initial phase of the study that included various configurations of rubblemound and floating breakwaters. This phase narrowed the alternatives to three basic concept alternatives: one with an offshore detached rubblemound breakwater to the northeast and a floating breakwater to the southwest, one with an offshore detached rubblemound breakwater to the northeast and a rubblemound breakwater to the southwest, and one with an inner detached rubblemound breakwater to the east and southwest. Several minor variations of these concept alternatives were analyzed and refined to define the six alternatives considered. No sites other than the existing harbor site were explored in detail for consideration.

After a thorough evaluation of the wave climate in Settler Cove, it was determined that rubblemound breakwaters for protection from the northeasterly wave exposure and

floating or rubblemound breakwaters for protection from the southwesterly wave exposure were most appropriate and cost-effective. Relatively shallow water depths make construction of rubblemound breakwaters economically feasible for the project.

2.2.2 Alternative 1A

Alternative 1A would consist of rubblemound and floating breakwaters. The existing floating breakwater would be removed and disposed of at an upland site. No dredging would be required. No additional upland staging features are anticipated. This alternative is shown in figure 2, and specifications are contained table 1. Alternative 1A incorporates the following: a new 700-foot-long detached rubblemound breakwater northeast of the existing breakwater, 732 linear feet of concrete floating breakwater, a 40-foot-long extension of the existing breakwater to the west for reduction in the existing breach width from the shoreline, and a 75-foot-long extension of the stub breakwater to further reduce the breach width. The existing mooring basin would remain unchanged with this alternative. The 10-acre mooring basin could accommodate the range of vessels in the fleet with stalls oriented with the prevailing wind direction, as at present. The harbor entrance would be oriented with more of an "S-turn" movement around the heads of the new and existing breakwaters and into the maneuvering area. This entrance channel configuration is somewhat different from the existing one but was designed to meet safe navigation criteria under extreme wave and tidal current conditions. A new navigation marker light would be established along with the existing one to guide mariners into the harbor. The new floating breakwaters would replace the existing ones. Their orientation would be slightly modified to provide full wave protection from the southwest.

Harbor Basin. The harbor basin would not require dredging since existing depths range from -10 feet to -18 feet MLLW. A total combined maneuvering and mooring basin area of approximately 10 acres would be available in the basin for alternative 1A.

Table 1. Alternative 1A specifications

New Breakwater	
Length	700 ft
"A" Armor	19,600 yd^3
"B" Rock (Filter & toe Berm)	12,900 yd^3
Core Stone	25,900 yd^3
Footprint	2.33 ac
Southeast Floating	
Length	732 ft
Existing breakwater	
Length extension	40 ft
Stub breakwater	75 ft
Area	0.28ac

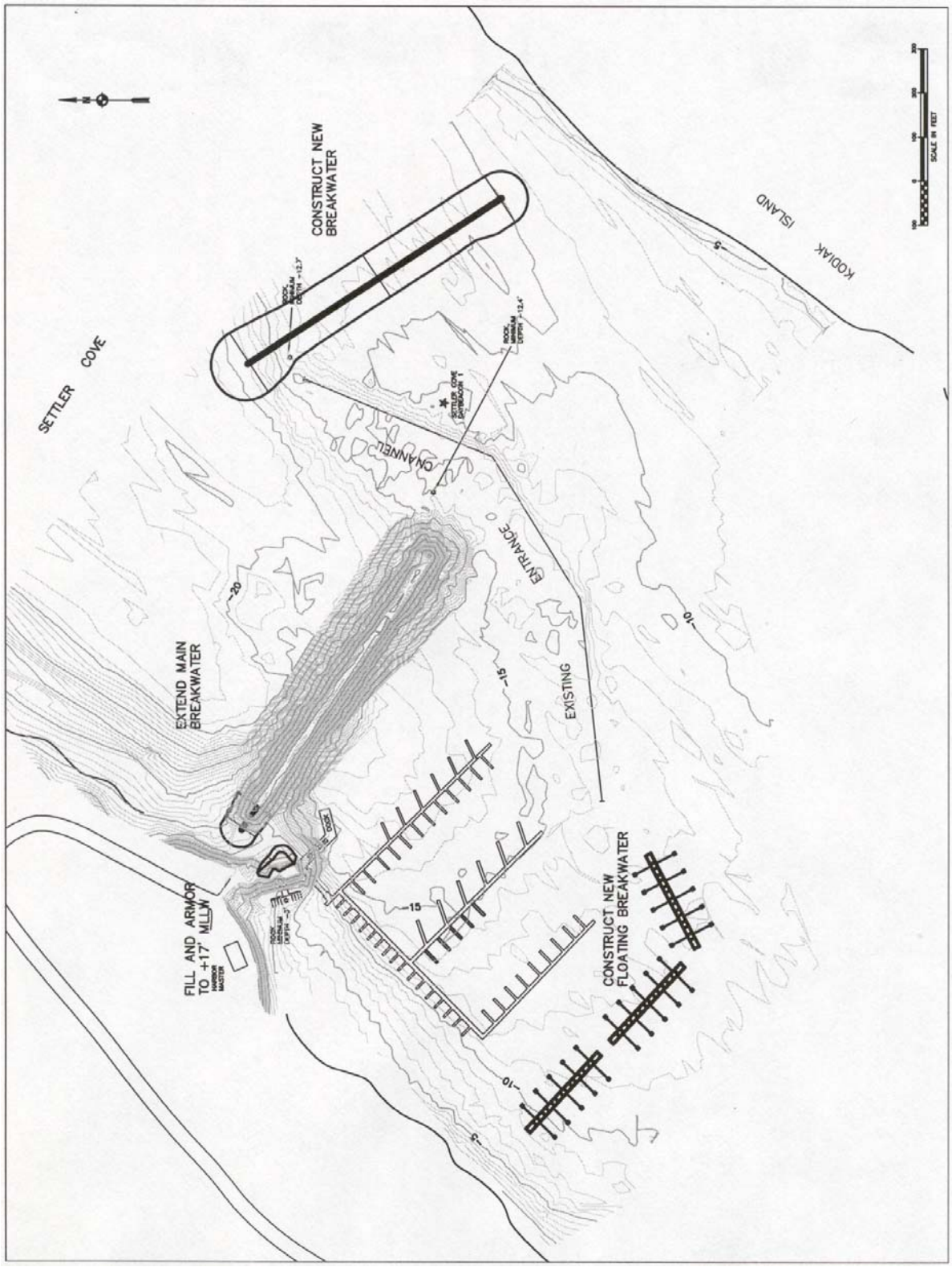

Figure 2. Alternative 1A.

2.2.3 Alternative 1B

Alternative 1B is very similar in configuration to alternative 1A. The difference between the two is that the southern limit of the harbor basin would be protected by a rubblemound breakwater instead of a floating breakwater. This alternative, shown in figure 3, incorporates the following: a new 700-foot-long detached rubblemound breakwater northeast of the existing breakwater, an 860-foot-long detached rubblemound breakwater southwest of the basin, a 40-foot-long extension of the existing breakwater to the west for reduction in the existing breach width, and a 75-foot-long extension of the stub breakwater to further reduce the breach width. Alternative specifications are in table 2. The existing mooring basin would remain unchanged with this alternative. The remaining harbor features would be similar to those of Alternative 1A. The new southwest rubblemound breakwater would replace the existing floating breakwaters.

Harbor Basin. The harbor basin would have the same dimensions, depths, and orientation as that for Alternative 1A.

Table 2. Alternative 1B specifications.

New Breakwater	
Length	700 ft
"A" Armor	19,600 yd^3
"B" Rock (Filter & toe berm)	12,900 yd^3
Core Stone	25,900 yd^3
Footprint	2.33 ac
Southwest Breakwater	
Length	860 ft
"A" Armor	7,100 yd^3
"B" Rock (Filter & toe berm)	0
Core Stone	31,400 yd^3
Footprint	1.84 ac
Existing breakwater	
Length extension	40 ft
Fill extension	75 ft
Area	0.28ac

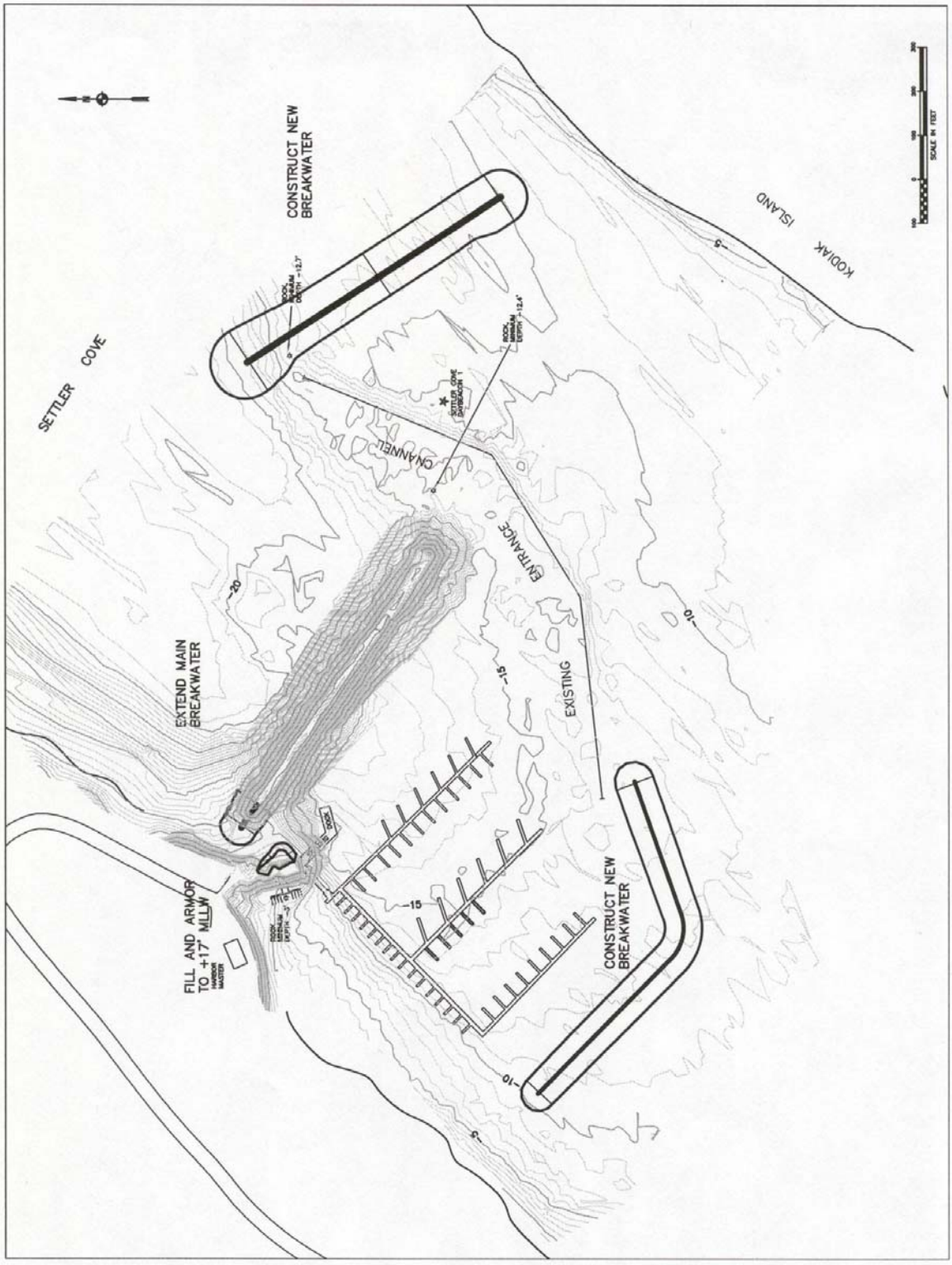

Figure 3. Alternative 1B.

2.2.4 Alternative 3B

This alternative was laid out to protect the existing mooring area. It would also take advantage of relatively shallower water depths along the eastern perimeter of the basin. Alternative 3B would be protected by a new rubblemound breakwater along its southwestern and eastern perimeter. This alternative, shown in figure 4, incorporates the following: a new 1,360-foot-long detached rubblemound breakwater southwest and east of the basin, a 40-foot-long extension of the existing breakwater to the west to reduce the existing breach width, and a 75-foot-long extension of the stub breakwater to further reduce the breach width. The existing mooring basin would remain unchanged with this alternative with no additional dredging. The specifications for this alternative are in table 3. The remaining harbor features would be similar to those of Alternatives 1A and 1B. An additional new navigation marker light would be established at the head of the new southwest breakwater to guide mariners into the harbor. The southwest portion of the new rubblemound breakwater would replace the existing floating breakwaters.

Harbor Basin. The harbor basin would be similar to those of Alternatives 1A and 1B. A total combined maneuvering and mooring basin area of approximately 12 acres would be available in the basin for alternative 3B.

Alternative 3B would consist of a single rubblemound breakwater. The existing floating breakwater would be removed and disposed of at an upland site. No dredging would be required.

Table 3. Alternative 3B specifications

New Breakwater	
Length	1,360 ft
"A" Armor	30,100 yd^3
"B" Rock (Filter & toe berm)	14,100 yd^3
Core Stone	48,800 yd^3
Footprint	3.26 acres
Existing breakwater	
Length extension	40 ft
Stub breakwater	75 ft
Area	0.28Ac

2.3 Discussion and Evaluation of Basin Alternatives

The existing floating breakwaters are nearing the end of their useful life. Replacement cost for a similar breakwater ($2,600,000) exceeds that of a rubblemound breakwater ($1,500,000). Limited project benefits may not be able to economically justify a floating breakwater. The alternatives would provide the same level of economic benefits.

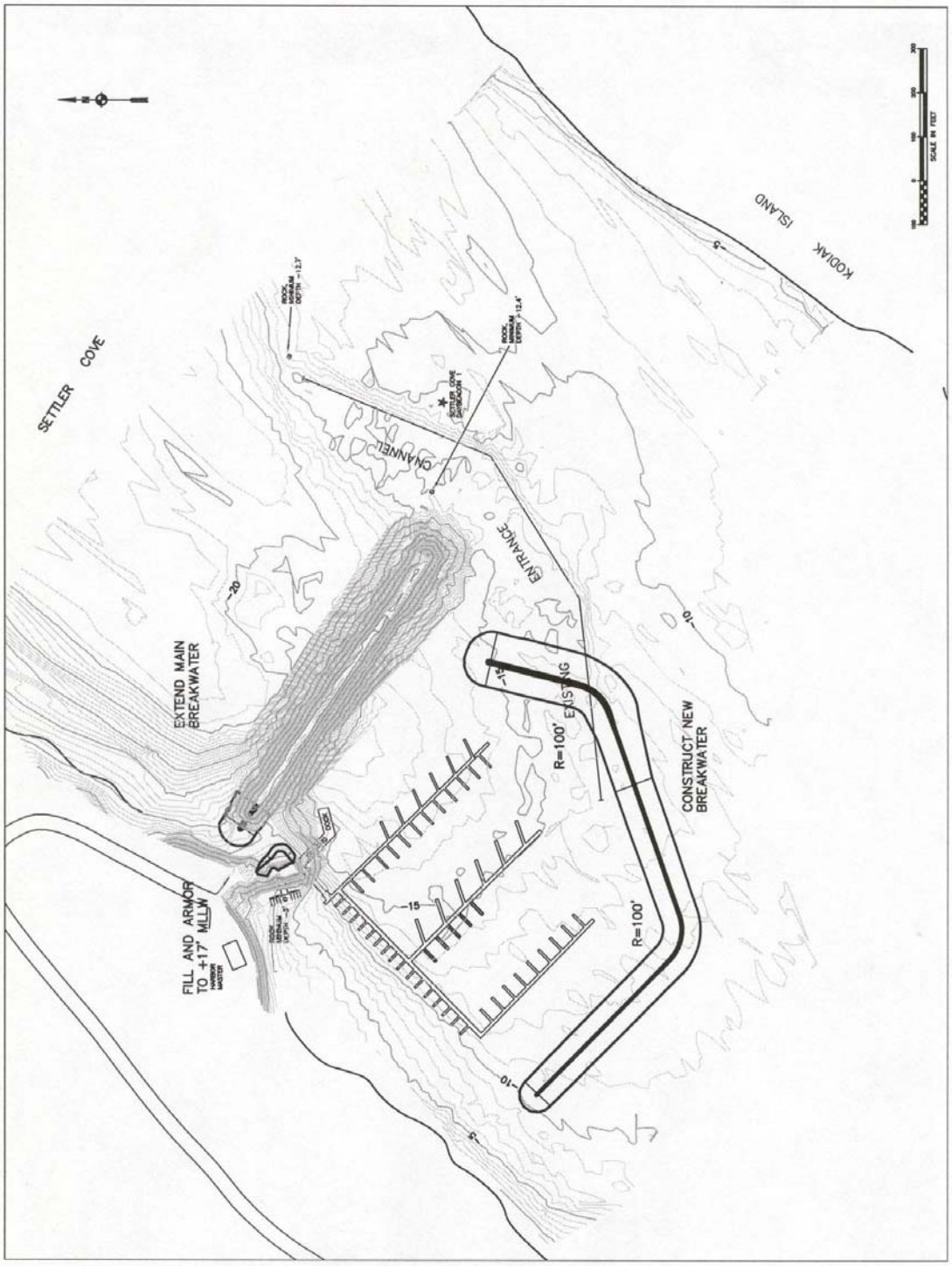

Figure 4. Alternative 3B.

Based on the evaluation matrix of functional and environmental design parameters, the alternatives were shown to be relatively equal in overall performance.

2.3.1 Breach Alternative A

Breach Alternative A, shown in figure 5, would consist of a 150-foot-long detached breakwater and a 75-foot extension of the stub breakwater. The opening between the detached breakwater and shoreline would form a 30-foot breach. The opening between the main and stub breakwaters would be reduced from 65 to 30 feet. The invert elevations through the breach would remain the same at +5 feet MLLW. No dredging would be required. The specifications for this alternative are in table. 4

Figure 5. Breach Alternative A.

Table 4. Detached Breakwater

Breach A	
Length	150 ft
"A" Armor	6,000 CY
"B" Rock (Filter & toe berm)	8,300 CY
Core Stone	6,000 CY
Footprint	0.56 ac
Stub breakwater	
Length	75 ft
"A" Armor	330 yd^3
"B" Rock (Filter & toe berm)	300 yd^3
Core Stone	1,100 yd^3
Footprint	0.15 acres
Breach	
Width	30 ft
Elevation	+5 ft, MLW

2.3.2 Breach Alternative B

Breach Alternative B, shown in figure 6, would consist of a 40-foot-long extension of the main breakwater and a 75-foot-long extension of the stub breakwater. The breach width would be reduced from 65 to 30 feet. The invert elevation through the breach would remain the same at +5 feet, MLLW. No dredging would be required. The specifications for this alternative are in table 5.

Figure 6. Breach Alternative B.

Table 5. Main Breakwater Extension

Breach B	
Length	40 ft
"A" Armor	550 yd^3
"B" Rock (Filter & toe berm)	550 yd^3
Core Stone	300 yd^3
Footprint	0.13 acres
Stub breakwater	
Length	75 ft
"A" Armor	330 yd^3
"B" Rock (Filter & toe berm)	300 yd^3
Core Stone	1,100 yd^3
Footprint	0.15 acres
Breach	
Width	30 ft
Elevation	+5 ft, MLW

2.4 Discussion and Evaluation of Breach Alternatives

The breach alternatives were design to reduce ocean waves, to prevent debris (drift logs) from entering the mooring basin, and to permit continued near-shore fish passage. The alternatives would provide the same level of protection from ocean waves and debris. Cost for Breach Alternative A (stub breakwater) would be slightly higher than Breach Alternative B.

2.5 Basin and Breach Alternatives Excluded From Detailed Study

Several alternatives for the mooring basin and breach were eliminated during the preliminary alternative evaluation. Shown below are basin alternatives. Breach alternatives (not shown) were eliminated from further study for several reasons: (1) breach was closed, (2) breach did not adequately reduce the wave environment through the breach, or (3) breach alternative was not cost effective.

Alternative eliminated because of the elimination of the near-shore migratory passage for juvenile fish.

Alternative eliminated because of the elimination of the near-shore migratory passage for juvenile fish.

Alternative eliminated because of the volume and cost of dredging and blasting required.

Alternative eliminated because of the excessive volume and cost of breakwater fill material.

3.0 ENVIRONMENTAL SETTING

3.1 Geographical Location

The city of Port Lions (population 256) is on the shore of Settler Cove on Kodiak Island, about 30 air miles northwest of the city of Kodiak and 260 air miles southwest of Anchorage (figure 1). Port Lions is at approximately 57º 52' N Latitude, 152º 53' W Longitude (Sec. 05, T027S, R022W, Seward Meridian) and is in the Kodiak Recording District. The Port Lions area encompasses 6.3 square miles of land and 3.7 square miles of water.

3.2 Social/Cultural Resources

3.2.1 Community History

The displaced inhabitants of Afognak, which was destroyed by a tsunami after the 1964 Good Friday Earthquake, founded Port Lions that same year. The community was named in honor of the Lions Club for their support in rebuilding and relocating the village. The city government was incorporated in 1966. For many years, Port Lions was the site of the large Wakefield Cannery on Peregrebni Point. The cannery burned in March 1975. Soon thereafter, the village corporation purchased a 149-foot floating processor and processed crab in the area intermittently between 1975 and 1980. A small sawmill south of town operated until 1976.

3.2.2 History

The Kachemak tradition appears on Kodiak Island from 4,000 years ago and extends to 700 years ago. It is divided into early and late phases with numerous sub phases for the Kenai Peninsula, Alaska Peninsula, and Prince William Sound. Based on archaeological surveys, it appears the population was concentrated along the shoreline or along important salmon streams. Seasonal sites have been recorded inland. Settlement sizes during this time were probably between 100 and 200 people. Houses were 4 to 5 meters wide with stone lined hearths (Clark 2001).

Knecht (1995) argues that based on archaeological and physical anthropological evidence, the Koniag tradition that followed developed in place from the Kachemak tradition. The Koniag tradition is divided into the Early Koniag Phase (700 to 500 years ago) and the Late Koniag Phase (500 years ago until contact). This was during the peak of the Little Ice Age, which Knecht suggests corresponded with settlement patterns and environmental adaptations. Village size and house sizes increased dramatically. At Karluk One, fishing was more emphasized than it had been before, and sea mammal hunting and shellfish gathering apparently decreased. With environmental changes, shifts in subsistence emphasis, and a change in settlement patterns came a change in features and artifact assemblages.

The end of the Koniag tradition came with Russian contact in 1761 A.D. The initial contacts were not amicable and the Koniag either kept the Russians contained near their ships or forced the Russians to flee. Later, Russian explorers took hostages or used cannons to protect their men (Knecht 1995). A trading post was built at Three Saints Bay in 1784. Hostages taken from important families were held there so the Russians would not be attacked (Clark 1984). People were forced to work for the post staying at small work camps. They hunted, processed food, and trapped foxes. Soon epidemics reduced the population from an estimated 9,000 people to 6,000 people only 20 years later. The population dropped to 5,000 after smallpox was contracted, and eventually 3,000 by the mid 1800s. With the integration of Russian culture, Russian language and the Russian Orthodox Church became important aspects of Kodiak Island culture.

The American period began in 1867 with the purchase of Alaska from Russia. With the American entrepreneurs that soon arrived came canneries and the commercial fishing industry. Government agencies began taking over social and infrastructure obligations that had been handled before by the Russian Orthodox Church (Davis 1984). Housing, schools, roads, airfields, and sewers were provided or controlled by government agencies.

Historic and Pre-contact Sites. Two sites recorded by the Alaska Heritage Resources Survey (AHRS) are within the town site of Port Lions. The Nativity of the Theotokos Chapel (KOD-00192) was built in 1965. Evidence of the earlier occupation includes petroglyphs of concentric circles and a fish (KOD-00365) north near the bridge. Elders reported that the remains of an earlier village lie under the modern town of Port Lions (AHRS).

A small precontact site (KOD-00452) is approximately ¾ of a mile northeast of the harbor site near the airport. The site is in the intertidal zone and consists of small chert flakes. Two sites are near Peregrebni Point. One has not been described (KOD-00236). KOD-00051 is a Late Kachemak, pre-contact village site. Another Kachemak tradition site is near Port Wakefield (KOD-00050) and associated with historic period garden plots. South of this is a shell bearing midden site (KOD-00049) with historic period garden plot features on the surface.

None of the sites are within the area of potential effect and would not be affected by access or activities associated with the construction at the site. The harbor itself was built in 1981 and is not of exceptional importance.

3.2.3 Economy

The economy of Port Lions is based primarily on commercial fishing, and 24 residents hold commercial fishing permits (DCED 200X). There are no fish processing facilities in Port Lions.

Tourism is also an important source of income for many residents, and there are several small lodges and bed and breakfast accommodations in Port Lions that cater mostly to hunters and sport fishers. The commercial store in Port Lions is well stocked with many

consumable and other daily-need items, but larger items are mostly bought in Kodiak or Seattle.

All the residents depend to some extent on subsistence activities for food sources, such as salmon, crab, halibut, shrimp, clams, duck, seal, deer, and rabbit. They use their vessels to access fishing grounds and to travel to hunting areas.

Public Facilities. The BIA and Indian Health Service built the community water and sewer system in 1965. Over 100 residences are connected to the city's piped water and sewer systems and 95 percent of these have full plumbing. The city has a community septic tank near the causeway at the head of Settler Cove. A transmission line carries the sewage along the seabed and across the cove. The line continues overland and into Kizhuyak Bay. The pipe outfall is 1,200 feet offshore. The Branchwater Creek Reservoir provides water, which is treated and stored in a 125,000-gallon tank. The existing dam is weakening, but funding has been provided to make repairs. A local priority is to construct a new 500,000-gallon reservoir on the creek. A new landfill site has been identified.

The Port Lions School is administered by the Kodiak Island Borough School District, and serves children in grades kindergarten through grade 12. There is also a medical clinic in Port Lions.

Transportation. Port Lions is accessible by air and water. There is a state-owned 2,200-foot gravel airstrip, and seaplanes may use the city dock. Regular and charter flights are available from Kodiak. The boat harbor, with breakwater and docks, provided moorage for 82 boats, but many of the docks were destroyed in a storm and not rebuilt. Commercial water taxi service between Port Lions and the road head at Anton Larson Bay is available at the Port Lions Harbor. The State ferry also calls on Port Lions twice per month between May and October and barge service is available from Seattle.

3.2.4 Environmental Justice

On February 11, 1994, President Clinton issued Executive Order 12898, Federal Actions to Address Environmental Justice in Minority and Low-income Populations. The order directs federal agencies to identify and address disproportionately high and adverse human health and environmental effects on minority and low-income populations. For this reason, demographic information on ethnicity, race, and poverty status is provided in this section.

As described in the Executive Order, minority is defined as African American, Hispanic, Asian and Pacific Islander, American Indian, Alaska Native, and other non-white persons. The racial breakdown in the Kodiak Island Borough and in Port Lions is presented in figures 7 and 8, respectively.

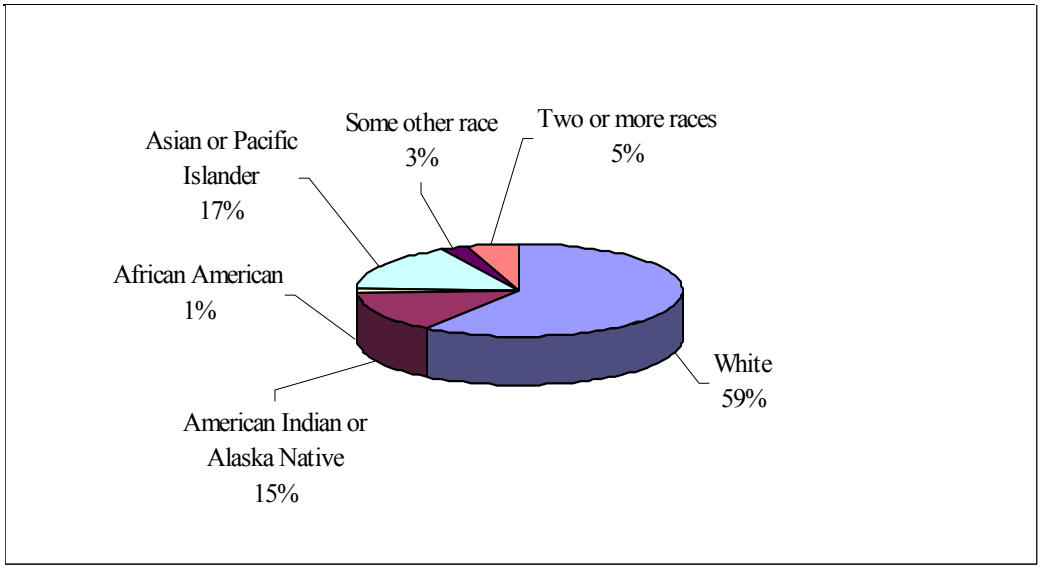

Figure 7. Racial Demographics of Kodiak Island Borough

As identified in the 2000 census, 59.7 percent of the Kodiak Island Borough population was white, 16.8 percent was Asian or Pacific Islander, 14.6 percent was American Indian or Alaska Native, 1 percent was African American, 2.8 percent was reported as some other race, and 5.2 percent declared two or more races. The Hispanic population is included in the persons of two or more races category. This is compared with 63.3 percent American or Alaska Native, 34.8 percent white, and 2 percent some other race at Port Lions.

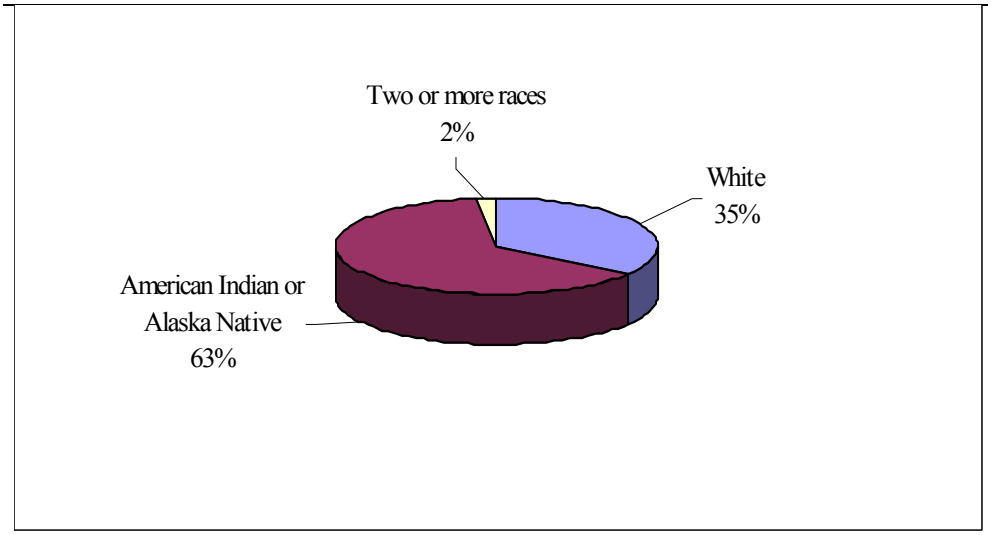

Figure 8. Racial demographics of Port Lions.

The threshold for low-income status is best defined using the Department of Health and Human Services poverty guidelines, which are adjusted annually. The per capita income in the Kodiak Island Borough was $22,195 a year. Of the Borough population, 6.6 percent (901 individuals or 151 families) was living below the weighted average poverty threshold. At Port Lions the per capita income was $17,492 a year and 12.1 percent of the population (35 individuals or 10 families) was living below the weighted average poverty threshold.

Community	Population	No. Individuals below poverty threshold	% of total population
Kodiak Island Borough	13,913	901	6.6%
Port Lions	256	35	12.1

The percent of people living below the weighted annual poverty threshold is not significantly greater than the surrounding area. On the other hand, there is a significantly greater minority population in Port Lions compared with the surrounding area and more than 50 percent of the population of Port Lions is of minority status.

3.2.5 Protection of Children

On April 21, 1997, President Clinton issued Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks. The order directs federal agencies to identify and assess environmental health risks and safety risks that may disproportionately affect children. This executive order is addressed in the environmental consequences section 4.2.

3.3 Physical Environment

3.3.1 Climate

The climate is dominated by a strong marine influence. There is little or no freezing weather, moderate precipitation, and frequent cloud cover and fog. Severe storms are common from December through February. Annual precipitation is 54 inches, with 75 inches of snowfall. Temperatures remain within a narrow range, from 20 to 60 degrees F. Ice sometimes forms in the cove during extreme temperatures.

3.3.2 Air Quality

Port Lions does not have nor is it close to heavy industry and therefore has excellent air quality. It is not in a non-attainment area.

3.3.3 Topography

The land area surrounding Port Lions is generally low-lying topography of less than 100 feet in elevation. To the west of Port Lions, a broad valley slopes upward to about 300

feet and Mount Ellison, about 2.5 miles north of the harbor site, is the highest point in the area at 2,288 feet.

3.3.4 Geology

The Kodiak Island group, including Port Lions, is overlain by a thick series of slate, graywacke and conglomerate of late Mesozoic age. The slate and graywacke material is predominant under the Port Lions harbor. A large mass of diorite lies axially along the center of Kodiak Island and numerous smaller intrusions of similar material are found on the island. An intrusion of granodiorite material is exposed across from Port Lions at Kizhuyak Point on the east head of Anton Larson Bay.

3.3.5 Soils

Organic soils on Kodiak Island are generally thin, low in ph, and in places, poorly drained. A layer of volcanic ash from the 1911 Mount Katmai eruption on the Alaska Peninsula is evident in places.

3.3.6 Marine Substrate

The marine substrate in the Port Lions area is composed mostly of the underlying graywacke and shale materials that appears as bedrock in many places. Other bottom types are described as black mud on the area marine chart (NOAA 1975). In Settler Cove the visible bottom is rocky in some areas, but is mostly composed of sand, mud, and broken shell on the surface. Kodiak Island was extensively glaciated during recent geologic history, and much of the near-shore substrate is composed of submerged glacial deposits reworked by storms, tides, and currents in relatively shallow waters.

3.3.7 Hydrology

Several small creeks drain the uplands of Mount Ellison and some shallow lakes in the broad valley a few miles to the west of town, and terminate in Port Lions. Settler Creek terminates at the head of Settler Cove. Branchwater Creek Reservoir provides the community water, which is treated and stored in a 125,000-gallon tank.

3.3.8 Water Quality

The head of Settler Cove drains a large brackish wetland, which becomes de-watered during low tide. A mathematical model of Settler Cove with and without the two breakwaters proposed at that time was conducted in 1976 by the Coastal Engineering Research Center as part of the Port Lions Feasibility Study and final EIS. Resource agencies had concerns that the proposed breakwaters would have a negative effect on circulation patterns, changing salinity, and freshwater dilution and thereby affect ecological conditions at the head of the cove. Also of concern were the added input of harbor related pollutants and the lack of dispersion of sewage from the community septic outfall closer to the head of the cove.

The model showed that the tidal prism of Settler Cove would not be affected by the placement of the breakwaters. The tidal prism is the volume of water that is exchanged within the basin or water body during any tidal cycle. Surface currents due to the tides would be altered only in the vicinity of the breakwaters. The streams flowing into Settler Cove would not be changed by the project, surface currents generated by these streams would not be changed, and therefore, salinity would be unchanged. This model did not address changes in ecological function. Resource agencies commenting on the 1977 EIS were not convinced by the model and the perceived negative biological effects remained an issue. Current mathematical models done by ADOT&PF (2003) indicate only localized eddies and gyres in the immediate harbor area. A positive factor is that sewage outfall is no longer discharged into Settler Cove. A new piped system has been in place for many years that bypasses Settler Cove and empties into Kizhuyak Bay.

3.3.9 Tides and Currents

Tides in Settler Cove are diurnal and unequal. One of the two high tides within 24 hours will be higher and one of two low tides will be lower than the other. The mean tide range is 8.7 feet and the extreme range is 18 feet (COE 2004).

3.4 Biological Environment

3.4.1 Terrestrial Habitats

Kodiak Island is in the coastal forest zone of Alaska. The vegetation around Port Lions is characterized by the western Hemlock-Sitka spruce forest community. Sitka black-tailed deer are present during winter along the coastline feeding on the algaes. Deer and beaver were introduced into the area. Brown bear and red fox are present as well as small mammals and birds typical of the coastal forest. The upland adjacent to the harbor has been cleared for harbor staging area.

3.4.2 Marine Habitats

The Port Lions general area, including the surrounding bays, are rich in species diversity and abundance. Commercial fishing for crab has declined since the harbor was first built. Fishing now centers on salmon, groundfish, sable fish, halibut, herring sac roe, fish bait, and shrimp. Settler Cove is noted for Pacific herring spawning.

A team of two Corps biologists and one U.S. Fish and Wildlife Service biologist visited Port Lions in January, March, and July 2002, for site-specific studies to characterize the environment in areas that might be affected by the harbor improvements. Since the navigation improvements are within the existing harbor, all the biological assemblages are generally the same for each alternative. An underwater camera was used to videotape the substrate along transects in the project areas, figure 9.

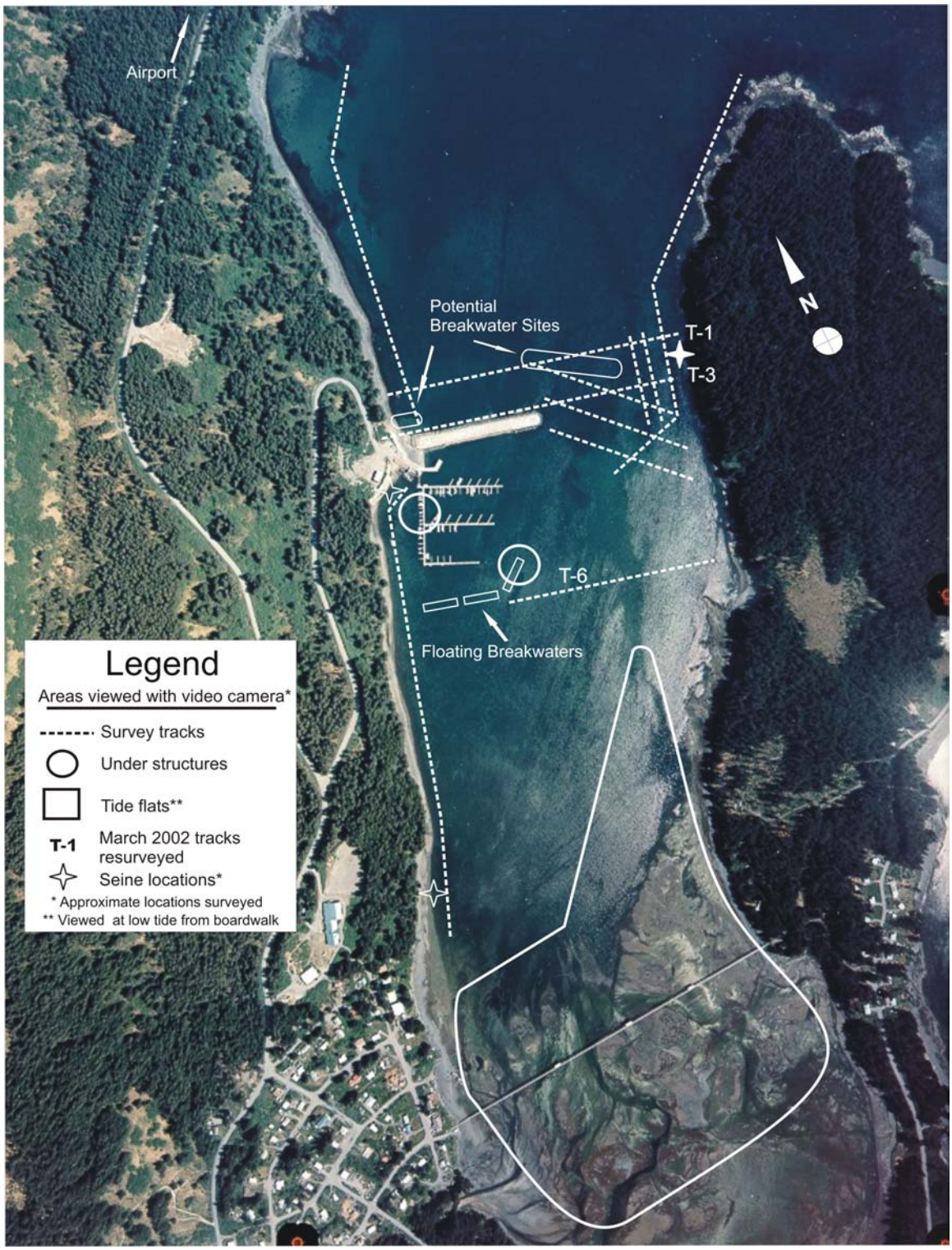

Figure 9. Approximate tracks on which the substrate was viewed with an underwater video camera in Settler Cove and the Port Lions harbor during July 15-17, 2002. Eelgrass coverage on the tide flats as estimated from the boardwalk during low tide. Seine sample locations are noted.

The Port Lions area has two general types of near-shore marine habitat: (1) deep water exposed to wave action and mostly characterized by large rocks and boulders at the base of steep cliffs (bull kelp is a common sight along this type of shoreline), and (2) coves and bays characterized by soft bottoms of mud, sand, gravel, and shell. Green and brown algae are common in this type of habitat, and eelgrass is found in the shallower areas with muddy bottoms. The harbor area is within the second type of habitat. A freshwater creek flows into Settler Cove at its head.

Areas of Settler Cove were surveyed at low tide to characterize the extent of eelgrass coverage. Approximately ½ mile was also surveyed along the west shoreline north of the harbor and along the east shoreline from the northwest head of Peregrebni Point south into Settler Cove to estimate the extent of eelgrass habitat in the subtidal zone.

The main objective of the survey was to view the substrate composition and epifauna in the areas that might be covered by placement of breakwaters in the harbor (figure 9, transect routes). Secondary objectives were to: (1) characterize fish species that might be using the eelgrass beds near the harbor for a summer nursery, (2) estimate the area of eelgrass growth in Settler Cove, and (3) establish whether bald eagles were nesting in the vicinity of the project.

Marine vegetation. Marine vegetation in the subtidal zone consisted mostly of broad-bladed brown alga in the genus *Laminaria*, *Desmarestia*, and *Cymathere*, but other forms of brown, red and green algae were also present. A dense mat of mostly brown algae covers the substrate that might be covered by a breakwater across the mouth of Settler Cove.

Subtidal boulders along the toe of the breakwater were heavily colonized by several species of brown, green, and red marine algae. The substrate that would likely be covered by a stub breakwater designed to dampen wave action and tidal surge through the fish passage breach is mostly sand interspersed with cobble. The cobble is colonized by brown algae. Eelgrass is not present in the breach area.

Eelgrass in Settler Cove**.** Eelgrass was visually mapped in Settler Cove with the video camera and with a GPS (figure 10). In general, eelgrass is limited to habitat outside the breakwater along the west shoreline toward the airport and is vary sparse. A few thin patches grow outside Settler Cove, but undoubtedly eelgrass grows in other places where conditions allow. Inside Settler Cove along the west shoreline, eelgrass grows densely in the harbor basin, but appears restricted to a narrow band about 20 to 30 feet wide in an area of soft substrate along the shore. A dense (in summer) eelgrass bed inside the harbor basin appears to be a rich nursery environment based on the diversity of species and numbers of individuals found there.

No eelgrass was seen for about ¼ mile along a rocky stretch of the west shore from the harbor basin toward the head of the cove. Substrate conditions change fronting the main settlement of Port Lions, and eelgrass once again grows in profusion. Eelgrass grows

almost continuously on suitable habitat on the submerged tidal flats at the head of Settler Cove and about two thirds of the way along the east shore, after which growth appears limited to patches on suitable substrate within about 75 feet of shore. No eelgrass grows in the general area of the proposed breakwaters.

Invertebrates. Significant numbers of sea stars, mainly the multi-rayed *Pyconpodia*, are present on the sea floor. Sea stars of the genus *Evasterias* are also present in Settler's Cove, but in fewer numbers than *Pyconpodia*.

Other invertebrates observed consisted of small snails, anemones, and crustaceans. Snails on the breakwater and boulders included several small species in the families Trochidae, Turbinidae, and Littorinidae. Anemones on the substrate appeared to be specifically flower anemones of the family Metridiiae. Small crustaceans that appeared to be Mysid shrimp were very dense. Clouds of *Mysis* to about ½ inch long were visible hovering near the sea bottom in some areas. Clams and other bivalve invertebrates appear to be abundant in the softer substrate types. A few Telmessus crabs and shed carapaces of Telmessus crabs were noted, but they do not seem particularly abundant in the area. Open areas of sand between thick patches of eelgrass were densely populated with greenspined sand dollars.

The docks and under the floating breakwaters were surveyed in the existing harbor. The substrate and water column under the docks and floating breakwaters appear to be rich in marine life when compared with some other areas of Settler Cove. The substrate under the docks was covered with brown, green, and red algae, and anemones. The dock floats were covered with a dense growth of blue mussels, anemones of several species, and kelp.

Several forms of jellyfish were abundant in the protected waters of the inner cells on the breakwater floats. The algae attached to the floats grow long tentacles that extended toward the bottom.

Fish. Few fish were observed by the underwater camera except juvenile cod and adult greenling. Schools of juvenile fish assumed to be Pacific cod and adult cod were visible among the growth under the floating breakwater. Large greenlings appeared abundant on the bottom.

Beach seining was conducted to sample the near-shore fish and invertebrate species. Three areas with eelgrass were seined with a 30 by 6-foot seine of ½ inch mesh: one in the existing harbor, one near the head of Settler Cove, and one on the east shore opposite the existing harbor

The second seine set was in a dense area of eelgrass along the west shore of inner Settler Cove about ¼ mile from the harbor. Unlike eelgrass in the first seine set, this eelgrass appeared to be uninfluenced by the harbor. This seine set produced the same juvenile

species, but fewer in number. This seine set also produced an adult greenling about 8-inches long. A skip-molt Telmessus crab was also captured by hand on this site.

The third seine set was across the cove from the harbor. A few juvenile cod, juvenile silver spot sculpins, juvenile whitespot and kelp greenling, a tubenose poacher, and a small great sculpin about 10 inches long were caught. Several small tidepool sculpins were also caught in this set.

Table 6. The number of juvenile fish captured and the species composition is only an index of representative species present because some small fish were seen to escape through the ½ inch mesh of the seine. Seining was during a 0 tide.

Set #	North Latitude	West Longitude	Species	Number
1	57 52.377	152 52.134	Silver spot sculpin	5
Comment: water temp. 13.5° C			Cod species	49
			Tubesnout (adult)	2
			Whitespot greenling	5
Comment: eel-like fish (blenny, prickleback?) about 8 inches long escaped from seine				
2	57 52.121	152 52.522	Masked greenling (adult)	1
			Cod species	4
			Silver spot sculpin	15
			Whitespot greenling	19
			Kelp greenling	1
			Tubesnout (adult)	3
			Rock greenling	9
Comment: One-skip molt helmet crab (*Telmessus cheiragonus*) caught in eelgrass after set.				
3	57 52.148	152 51.636	Tubesnout poacher (adult)	1
			Great Sculpin (adult)	1
			Silver spot sculpin	7
			Cod species	4
			Hermit crab	1
			White spot greenling	1
			Tidepool sculpin (adult?)	4

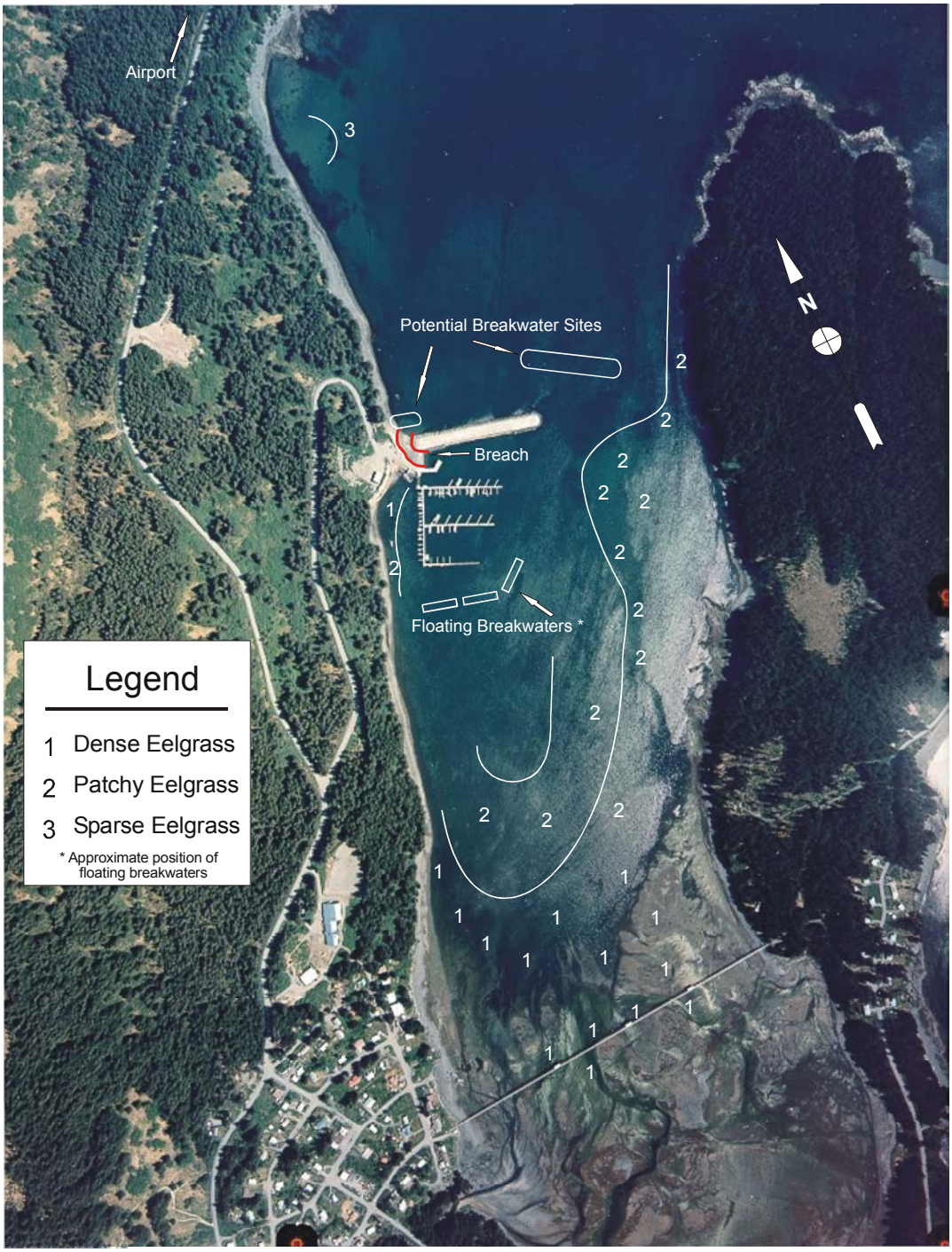

Figure 10. Settler Cove and the Port Lions harbor with the relative area and density of eelgrass estimated from field observations taken during March 6 and July 15-17, 2002.

3.4.3 Essential Fish Habitat

The 1996 reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) amendments mandate that Federal agencies assess the effects of Federal projects on essential fish habitat (EFH [commercial fish stocks in all life stages and associated habitats]) and consult with the Department of Commerce (50 CFR 600.905-930). Groundfish Fishery Management Plans (FMP) list four species categories and the forage fish category. The four species categories are the target species category (pollock, cod, etc.); the other species category (sculpins, skates, etc.); the prohibited species category (halibut, herring, etc.); and the nonspecified species category (urchin, rattails, etc.). EFH must be described and identified for those species listed in the target species and the other species categories only. The prohibited species and the nonspecified species categories are outside the FMP and will not be considered EFH for the purposes of sections 303(a)(7) and 305(b) of the MSA.

Habitats of particular concern are areas known to be important to species in need of additional levels of protection from adverse effects. In determining habitat types of particular concern, consideration should be given to the sensitivity, exposure, rarity, and the importance of the ecological function of the habitat. Habitat areas of particular concern include near-shore areas of intertidal and submerged vegetation, rock, and other substrates. These areas provide food and rearing habitat for juvenile groundfish and spawning areas for some species. All near-shore marine and estuarine habitats used by Pacific salmon, such as eelgrass beds, submerged aquatic vegetation (seaweeds), emergent vegetated wetlands, and certain intertidal zones, are sensitive to natural or human induced environmental degradation, especially in urban areas and in other areas adjacent to intensive human-induced developmental activities.

Essential fish habitat means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. For the purpose of interpreting the definition of essential fish habitat, “waters” include aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and may include areas historically used by fish where appropriate; “substrate” includes sediment, hard bottom, structures underlying the waters, and associated biological communities; “necessary” means the habitat required to support a sustainable fishery and a healthy ecosystem; and “spawning, breading, feeding, or growth to maturity” covers a species’ full life cycle.

Species expected to use the near-shore habitats in the project area during primarily juvenile life stages include five species of Pacific salmon (pink, coho, chum, sockeye, and king). Several groundfish, shellfish, and other species are also present in near-shore waters and include Pacific cod juveniles, sculpin spp. adults and juveniles, shallow-water flatfish, scallops and king crab early juveniles, and forage fish such as eulachon, capelin, and sand lance (National Marine Fisheries Service, et al., Habitat Assessment Reports for Essential Fish Habitat, 1998). All species selected are of commercial fisheries value and are present in or near the project area during some stage of their life histories. The Alaska District has coordinated with National Marine Fisheries Service and developed the following list of fish and shellfish species present in the project area. Since the harbor

improvement alternatives are in the same general area, there are no differences in habitat use or values between alternatives.

Pacific Salmon. Salmon migrate, spawn, and rear in the near-shore tidal areas in Settler Cove. Juvenile salmon use near-shore migration corridors and can be expected to be in the project site seasonally. Settler Creek at the head of Settler Cove has a pink salmon run of no more than 1,000 fish that are mostly intertidal spawners (Kevin Adkins, personal communication). The fry of this stock outmigrates through the harbor basin in May and early June. The sockeye salmon run in Settler Creek is introduced (Kevin Adkins, personal communication), but a small run of coho salmon is native (COE 1977).

The head and eastern shore of Settler Cove is a rich and diverse marine and brackish water environment that includes eelgrass, marine algae, clam beds, salmon spawning grounds, and a diverse population of fish (during summer). Assuming the pink salmon are intertidal spawners (Kevin Adkins personal communication), a majority of a year-class of Port Lions River pink salmon would be incubating under the intertidal gravel at the head of the cove during winter.

Rock Sole. This species spawns during the winter-early spring period. The eggs are demersal and adhesive, and incubation of the eggs is temperature dependent. Newly hatched larvae are pelagic and remain so until they are about 20 mm in length, when they assume their side-swimming, bottom-dwelling form. After spawning, rock sole begin actively feeding and commence a migration to the shallows of the continental shelf. Surveys have indicated that most of the population can be found at depths from 50 to 100 meters in substrates of gravel, mud, and sand.

Flathead Sole. Adults exhibit a benthic lifestyle and occupy separate winter spawning and summertime feeding distributions. Overwintering grounds are near the shelf margins and the adults migrate to the mid and outer continental shelf in April or May of each year for feeding. Spawning starts as early as January, primarily in deeper waters near the margins of the shelf. Eggs and larvae are planktonic. Size at metamorphosis is unknown as well as the age at 50 percent maturity.

Pacific Cod. Pacific cod is a transoceanic species, occurring at depth from shoreline to 500 meters and associated with mud/silt/clay to gravel substrate. Adults are demersal and form aggregations during the peak spawning season, which extends approximately from January through May. Eggs are demersal and adhesive and hatch in about 15 to 20 days. The next life stage is larval, which undergoes metamorphosis at about 25 to 35 mm. Small cod mainly feed on invertebrates while the large adults are mainly piscivorous.

Sculpin. This is a large circumboreal family of demersal fishes inhabiting a wide range of habitats in the north Pacific Ocean and Bering Sea. Habitats range from tidepools to water depths of 1,000 meters. Adult and juvenile sculpins are mainly known to be associated with substrates from mud/silt/clay to gravel. Most sculpins spawn in the winter. All species lay eggs, but some genera fertilization is internal. Eggs are generally

laid amongst rocks and are guarded by the males. The larval stage is found across broad areas of the shelf and slope. Sculpins generally eat small invertebrates

Red King Crab. Red king crab are typically at depths less than 300 meters within the inner shelf zone. They molt multiple times per year though age 3, after which molting is annual. Shallow inshore areas (less than 50 meters) are very important to king crab reproduction as they move onshore to molt and mate. Larval stages are distributed according to vertical swimming abilities, and the currents, mixing, or stratification of the water column. Generally, the larvae occupy the upper 30 meters of the water column, often in the mixing layer near the sea surface. After several molts, the crabs settle to the bottom. Settlement on habitat with adequate shelter, food, and temperature is imperative to survival of the first settling crabs. They prefer high relief habitat such as boulders, cobble, and shell debris. Young of the year require near-shore shallow habitat. Late juvenile stage crabs are most active at night when they feed and molt.

Forage Fish. Eulachon are found pelagically from the middle shelf to over the slope on unconsolidated bottom. They spawn in rivers on coarse sandy bottom. The larvae drift and develop at sea. Capelin are a coastal fish rarely found in waters deeper than 200 meters. Spawning occurs in spring and summer on coarse sand and fine gravel beaches. Sand lance are an inner shelf (1 to 50 meters) and middle shelf (50 to 100 meters) semi-demersal species occurring in sand and gravel habitats.

3.4.4 Marine Mammals

Sightings of sea otters were relatively common along the outer edge of the harbor near the floating breakwaters. Sea otters were mostly observed east of Settler Cove near the airport and a small island surrounded by reefs. Although sea otters were present in this area during the survey, which was conducted during the afternoon, they range throughout the survey area to forage during other times of the day and night. The area where otters were concentrated during the survey might be considered a resting and congregating area when they are not foraging for food. The number of sea otters seen resident in the area during the winter (13 otters) is likely representative of the local population

A large harbor seal was observed loafing on the surface in the inner habitat type. A local Native hunter reported that harbor seals often seek shallow areas with freshwater influence during this time of year.

One sea lion was seen swimming about 200 yards off the mouth of Settler Cove. Other marine mammal species that may occur in the vicinity of Port Lions include minke and killer whales, and Dall's and harbor porpoises.

3.4.5 Birds

Bald eagles appear to be more abundant at Port Lions in summer than in winter. Presumably, many of the bald eagles seen at Port Lions during the summer fly to Kodiak

during the winter to take advantage of the fish processing plants found there. There are presently no bald eagle nests at Port Lions, but there may be some at the head of Kizhuyak Bay (Kevin Adkins, personal communication). The majority of the bald eagles seen at Port Lions were juveniles.

Surveys along the shoreline in Settler Bay were conducted in January and March 2002 for the primary purpose of determining the presence of the threatened Steller's eider. No Steller's eiders were observed in January and only one male Steller's eider was observed in March.

A total of 317 mixed ducks, sea ducks and sea birds, 13 sea otters, and 1 harbor seal were observed and counted during the January survey (figure 11 and table 7). The survey area was represented by two general habitat types: (1) outer waters exposed to wave shock and characterized by little or no shallow littoral zone and areas of brown algae, and (2) the inner Settler Cove area characterized by a sand, mud, and shell substrate covered with patchy growths of brown and green algae, and eel grass. Distinct species occupied these habitats with relatively little overlap.

Oldsquaw sea duck was the dominant species (200) observed in the outer habitat type, followed by pelagic cormorant (80), and black scoter (65). Other species were observed in lesser numbers.

Greater scaup, a diving duck, was the dominant species in the inner habitat. Common goldeneye, another diving duck, followed scaup in abundance. Two species of merganser and mallard ducks were also present. Pelagic cormorants occupied the outer area of Settler Cove, where most rested on an outer float of the harbor.

The dominant species present during the March survey (table 8 and figure 12) was the common mallard (290). Mallards were a common sight feeding along the water line in inner Settler Cove. The second most common was two species of scaup ducks (260): the greater and lesser scaup. These bay ducks gathered in relatively large groups in mid to inner Settler Cove, where they were seen eating eelgrass. The blades of eelgrass seen floating on the surface of Settler Cove are likely rooted up from the bottom by this species. Scaups, mostly greater scaup, were also present outside Settler Cove, but in lower numbers. Other species common to Settler Cove were cormorants, golden eye ducks, red-breasted mergansers, and bufflehead ducks. The cormorants mostly rested on the floating breakwater in the small boat harbor. The inner Settler Cove area is occupied mostly by bay and puddle ducks, and red-breasted mergansers.

The dominant species observed in the outer habitat type was the oldsquaw sea duck (188), followed by black scoter (179) cormorants (166), and harlequin ducks (128). Other species were observed in lesser numbers. Several murrelets were observed over

Table 7. Bird counts by survey segment (figure 11) during Port Lions survey 1, January 7, 2002.

Segment	Species	Total
1	Common murre	14
	Black scoter	2
	Oldsquaw	59
	Pelagic cormorant	14
	Greater scaup	4
	Red-necked grebe	6
2	Common goldeneye	5
	Pelagic cormorant	27
	Oldsquaw	33
	Greater scaup	1
	Black scoter	47
	Common murre	18
	Loon species	1
3	Pelagic cormorant	29
	Harlequin duck	18
	Oldsquaw	82
	Surf scoter	3
	Red-necked grebe	9
	Black scoter	10
	Common murre	5
	Common goldeneye	3
	Sea otter (mammal)	3
4	Sea otter (mammal)	10
	Oldsquaw	26
	Harlequin duck	7
	Pelagic cormorant	10
	Black scoter	6
	Common murre	1
Settler Cove	Common goldeneye	56
	Red-breasted merganser	28
	Common merganser	6
	Pelagic cormorant	36
	Mallard duck	22
	Gadwall duck	2
	Greater scaup	161
	Bufflehead duck	8
	Black scoter	6
	Grebe species	1
	Oldsquaw	4
	Harbor seal	1
	Total birds and mammals counted	331

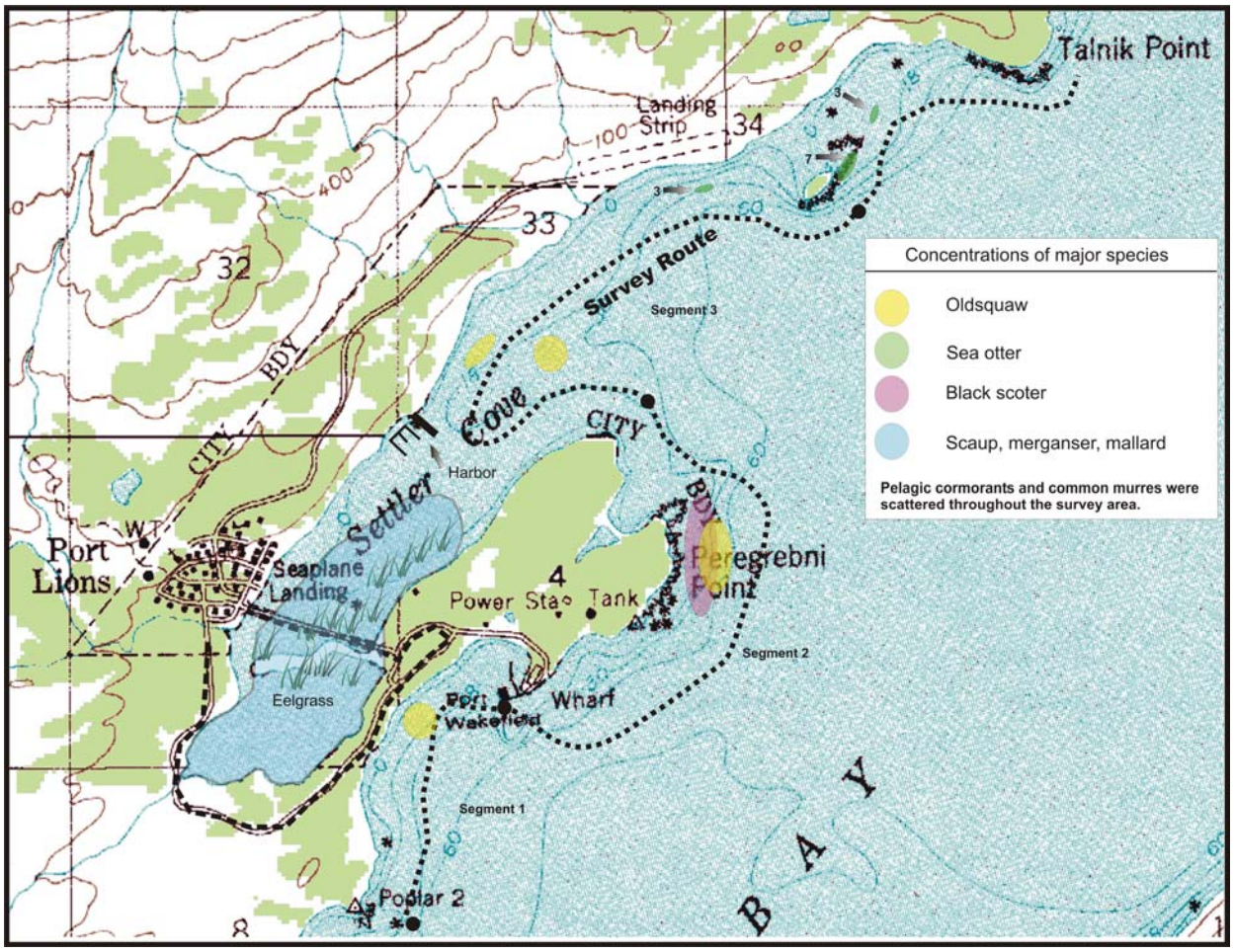

Figure 11. Survey route (Poplar 2 to Talnik Point) during the 7 January 2002 Steller's eider survey of Port Lions, Alaska, showing locations where concentrations of major species were observed. No Steller's eiders were observed during this survey.

deeper water along the survey track. Although most were too far away to positively identify, the Kittlitz murrelets may have been those observed. The Kittlitz murrelet is not listed as threatened or endangered, but is a species of concern designated by the U.S. Fish and Wildlife Service to study the need for listing.

Waterfowl greater scaup and mallard, and birds including flocks of northwestern crows were observed in the wetlands at the head of the bay. A few pigeon guillemots were observed. Greater scaup populations have been declining for about 20 years in some parts of their range. The cause of the decline is unknown, but an effort to understand the decline is being undertaken by researchers (8th International Waterfowl & Wetlands Symposium, 2001).

The deck of the floating breakwaters also provided a resting area for gulls and a nesting site for a pair of Arctic or Aleutian terns. A relatively large colony of cormorants used these breakwaters during the winter.

Table 8. Bird and marine mammal counts by survey segment (figure 12) during Port Lions survey 2, March 5, 2002.

Species Surveyed	Segment #1	Segment #2	Segment #3	Segment #4	Settler's Cove	Total counted
Mallard	0	0	0	0	290	290
Scaup species	0	0	38	0	209	247
Oldsquaw	85	13	82	6	2	188
Black scoter	11	74	62	25	7	179
Cormorant species	25	25	71	14	31	166
Harlequin duck	9	10	71	35	3	128
Common goldeneye	10	1	11	13	47	82
Surf scoter	2	0	26	12	0	40
Red breasted merganser	0	0	8	0	31	39
Bufflehead duck	1	0	5	0	17	23
Pigeon guillemot	6	15	0	0	0	21
Greater scaup	2	2	8	0	1	13
Murrelet species	1	3	0	5	0	9
Murre species	0	2	0	3	0	5
Common merganser	0	0	0	0	4	4
Sea otter	0	0	0	4	0	4
Harbor seal	0	0	2	0	0	2
Steller's eider	0	1	0	0	0	1
Red necked grebe	0	0	1	0	0	1
				Total number of individuals counted		1,442

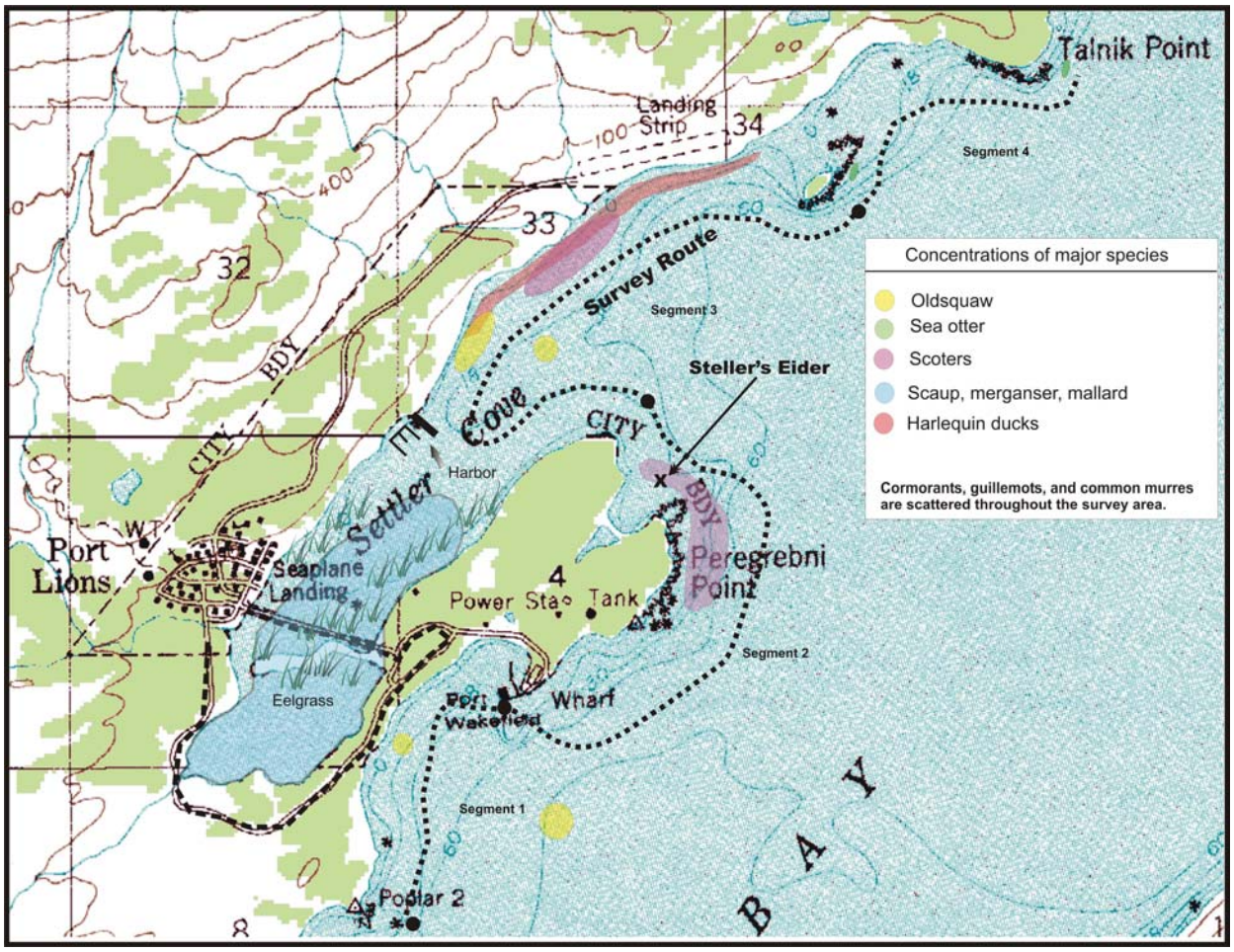

Figure 12. Locations of major species concentrations and the one Steller's eider seen during the March 5, 2002 sea duck survey at Port Lions, Alaska.

3.4.6 Threatened and Endangered Species

The threatened Steller's eider is known to be present during the winter season in the Kodiak Island archipelago. Surveys were conducted in the project vicinity during January and March 2002 to determine presence and habitat use. Survey methods are detailed in the scope of work contained in Appendix 3. No Steller's eiders were observed during the January survey and local hunters and hunting guides reported that this species does not inhabit waters near Port Lions. Trophy hunting for sea ducks by non-resident hunters staying at local lodges is a common practice in the Kodiak and Afognak Island area, and local guides and subsistence hunters know the species well. The local guides and hunters place the closest congregations of Steller's eiders to Port Lions in Kupreanof and Afognak Straits, some 6 miles overland and north of Port Lions, and in the Kodiak area.

One male Steller's eider was seen during the March survey. Although the Port Lions area does not have much of the shoal type habitat that Steller's eiders prefer, it is not surprising to see a Steller's eider in the area. Steller's eiders winter in large flocks near Kodiak and migrate to staging areas along the Bering Sea side of the Alaska Peninsula starting around March. Although Steller's eiders are not known to winter in the immediate Port Lions area, the presence of an occasional Steller's eider along the migration route during March or early April should be expected.

The seven species of whale (fin, right, humpback, blue, sperm, sei, and bowhead) listed under the Endangered Species Act are not likely to be found in the shallow water areas of Settler Bay. The western population of the Steller sea lion listed as endangered has been observed in the project area; however, no Steller sea lion rookeries are in proximity of Settler Bay.

4.0 ENVIRONMENTAL CONSEQUENCES

This section discusses the potential physical, biological, and socio-cultural effects that would result from construction of an expanded harbor, including the modifications to the existing breakwater and breach. The alternative plans are within the same area of the existing Port Lions harbor; therefore, the direct environmental effects would be similar. Construction of the breakwaters, modifications to the existing breakwater and the placement of fill for the breach, removal of the dilapidated floating breakwaters, and the additional inner harbor floats are construction activities. No upland infrastructure development is planned with this project.

Ecological effects to Settler Cove from the breakwater alignment in alternatives 1A and 1B are a concern identified by the USFWS. Potentially, the constriction of Settler Cove by the detached breakwater could change Settler Cove's overall ecology by changing circulation patterns, water velocity, sediment deposition, and flushing actions. This in turn could alter marine habitat, disrupt life cycles, and restrict or change species use within certain areas of Settler Cove. The significance of these changes is unknown

without further studies. Of particular concern is disruption of fish and invertebrate egg and larvae transport and survivability in Settler Cove (USFWS 2004).

4.1 Social/Cultural

4.1.1 No-Action Alternative

The vessels in the harbor would experience continued damages from storm induced winds and waves because of the lack of protection from the northeast. Several floats would not be fully utilized because of this lack of protection. This situation limits the efficiency of the harbor and prevents additional boats from using the harbor. Access to subsistence areas for residents without boat moorage may be hampered.

Environmental Justice/Effects to Children. The present harbor, if left as it is, does not pose a risk to children in the community. The school is not in proximity to the harbor. The harbor does not have hazardous structures or stored materials that would be accessible to children.

4.1.2 Alternatives 1 through 3, Breach Alternatives A and B

More moorage space would result in small increases in activity and growth for the community. The projected demand satisfies the communities future needs and provides space for transient vessels. The effects would not differ with any of the alternatives. Construction of the new harbor facilities would probably occur at the peak of the fishing, hunting, and tourism season; however, the community would have continued access to the harbor, so there would be minimal disruption of these activities. In the long term, subsistence and tourist fishing and hunting would be enhanced because the harbor changes would allow larger boats, a larger fishing fleet, safe and modern slips, and transient moorage. The town of Port Lions would be required to pay for harbor maintenance. Some costs could be recouped through slip fees and other services.

The project would not adversely affect minority populations. The proposed project does have the potential to adversely effect environments important to the community of Port Lions. There could be chronic releases of petroleum products, human refuse, fish waste, unburned lubricants from outboard motor exhausts, and leaching boat paints and preservatives. Several measures would be outlined in the Harbor Management Plan to deal with this problem, including refuse collection and a petroleum spill prevention and containment plan. The harbor alternatives have good circulation and flushing characteristics that would efficiently flush pollutants.

All the proposed breakwaters would provide increased wave protection. This would benefit the community because damage to the fleet would be minimized.

Hunting and fishing for subsistence and for tourism are very important to the community. The proposed project would allow more vessels and transient ships to dock at Port Lions, giving the community more access to resources. The harbor at Settler Cove is 1/2 mile from the town of Port Lions, where the school and other facilities are. For that reason,

the proposed project would not pose immediate safety risks to children at these facilities. The design of the harbor and the harbor management plan include safety measures that would help protect children.

The proposed project would not cause environmental health risks and safety risks that may disproportionately affect children.

Cultural Resources. No cultural resources are within the affected area of the harbor alternatives. The State Historic Preservation Officer has concurred with this determination. Correspondence is in Appendix 4.

4.2 Air Quality

4.2.1 No-Action Alternative

The air quality in Port Lions is excellent. This remote area does not have industries that contribute to air pollution.

4.2.2 Alternatives 1 through 3, Breach Alternatives A and B

Construction of breakwaters requires the use of heavy equipment such as cranes, trucks, and barges that use diesel fuel. Diesel fumes would temporarily cause a decrease in air quality but at very minimal levels.

4.3 Noise Effects

4.3.1 No-Action Alternative

Port Lions harbor is a busy harbor in the summer with average levels of vessel noise. The harbor is in the south part of town and is a good distance from homes. Noise levels are very minimal in the area.

4.3.2 Alternatives 1 through 3, Breach Alternatives A and B

Construction noise will be significant in the immediate harbor area during construction of the project. Operational noise levels for the expanded harbor would not be significant and would not disturb residential areas.

4.4 Water Quality

4.4.1 No-Action Alternative

A model study (contained in Appendix 4) was used to characterize the existing condition for the recommended plan, alternative 3B (ADOT&PF 2003). The model showed that the existing harbor basin water does not have strong enough momentum during the flood tide to efficiently flush all water out of the basin to exchange with water outside the

basin. As the tide ebbs, most of the basin water that flows along the shoreline is re-entrained back into the basin area. However, the strong winds and large tidal range contribute to the circulation of water in the area. There are no sewage outfalls into Settler Cove that would degrade the water quality. Fuel is not dispensed at the harbor.

4.4.2 General

Construction of breakwaters would increase water turbidity temporarily near the project area. Tidal current and action could cause any loosened fine-grained material to form a sediment plume over an undetermined area. Since the material at Settler Bay is primarily sand and gravel, suspended sediment plumes would be small but could temporarily lessen light penetration and photosynthesis and disturb filter feeders. Mixing and dilution in the overlying water would be expected to decrease turbidity levels in a short time.

Harbor operation and harbor-related activities historically degrade water quality by dumping petroleum products, human refuse, and fish wastes into the harbor area. Unburned lubricants from outboard exhausts and accidental fuel spills contribute to the contamination of harbor waters. Leaching boat paints and preservatives also slowly degrade the water. Harbors with good circulation and flushing characteristics quickly disperse pollutants and prevent them from accumulating in sediments and depleting the dissolved oxygen in the water. Additional discharges would be expected with the increase numbers of vessels in the proposed harbor.

Water quality and circulation criteria were established to minimize environmental degradation associated with harbor improvements. The conventional method for estimating harbor basin flushing is to use an average exchange coefficient for one tidal cycle. Flushing coefficients can be approximated by the tidal prism ratio: the difference in basin volume at high tide and low tide divided by the basin volume at high tide. It has been determined that average spatial values greater than 0.30 will provide for acceptable harbor basin flushing. It is also recommended that no more than 5 percent of the basin have values less than 0.15.

Another criterion for water quality and circulation is the aspect ratio of the basin. This value is a measure of the length divided by the width of the basin. Generally, aspect ratios of greater than 0.3 and less than 3.0 are desirable. Such geometry minimizes possible zones of stagnation and short-circuiting of circulation cells within the basin.

For proposed harbor improvements with floating breakwaters, the above criteria do not directly apply since the mooring area would not be fully enclosed and would not impede circulation except to reduce wave heights.

Alternative 1A . Circulation in the harbor basin would be driven primarily by tidal action and by wind-driven surface water currents that contribute to mixing in the water column. Flood and ebb tides would drive the circulation patterns in the mooring basin and the back portion of Settler Cove. This alternative would not enclose a harbor basin

proper; however, adequate water circulation based on existing conditions would be expected. The high tidal ranges in this area would promote good water exchange in the basin. To control accumulation of refuse in the water, refuse collection and disposal would be part of the harbor management plan. A fuel spill containment plan would also be part of the harbor management plan.

Although water quality would not be a significant issue in the harbor area, the issue of the overall circulation, flushing, and deposition changes caused by the additional breakwater in the channel is unknown within Settler Cove, especially at the head of the cove. The USFWS recommended further studies to determine environmental impacts if this alternative was the recommended plan. Even without this data, the impacts of alternatives 1A and 1B to the recommended plan 3B are comparable, having at least as much environmental effects besides the unknown adverse affects of channel constriction.

Alternative 1B. Circulation in the harbor basin would be driven primarily by tidal action and by wind-driven surface water currents that contribute to mixing in the water column. Flood and ebb tides would drive the circulation patterns in the mooring basin. This alternative would not fully enclose a harbor basin proper; however, it would somewhat restrict water circulation patterns in the mooring area due to the new southwest rubblemound breakwater. Circulation in the harbor basin would be expected to be similar as that of Alternative 1A since the gap between the existing breakwater and the new southwest breakwater would be very large (700 feet). The basin would have a tidal prism ratio of 0.39.

The aspect ratio of the basin was calculated to be 0.86. Good water quality and circulation are therefore expected in the harbor basin for Alternative 1A. The potential for altered circulation patterns within Settler Cove as discussed in alternative 1A also would apply to Alternative 1B.

Alternative 3B. Alternative 3B results, from the model study done by ADOT&PF, indicate a more flow-through exchange than the existing condition. During the flood phase of the tide, there is a strong flow through the main channel into the basin and somewhat lesser flow out of the breach. The flow through the breach moves toward the shoreline and is re-entrained back into the basin, which lowers the overall water exchange ratio. The curved breakwater works as a steering vane so that more of the flow is carried through the basin area. Circulation in the harbor basin would be driven primarily by tidal action and by wind-driven surface water currents that contribute to mixing in the water column. This alternative would more fully enclose a harbor basin proper and it could tend to drive water circulation patterns in the mooring area due to geometry of the basin and breakwaters. The basin would have tidal prism ratio of 0.46. The aspect ratio of the basin was calculated to be 0.81. Good water quality and circulation would therefore be expected in the harbor basin for alternative 3B.

Breach Alternatives A and B. The new breach design would constrict the opening from the existing breach width of 65 feet to 30 feet. The reduced wave energy flowing through the opening would not cause the area to become stagnant. Sufficient water at the higher tides would flow through the opening. Sedimentation would continue to require periodic dredging to maintain project depth at +5 feet MLLW. Currently, this material is dredged by the city of Port Lions for use in road improvements and other local projects.

A 404(b)(1) evaluation under the Clean Water Act has been prepared for the recommended alternative 3B and breach alternative B and is in Appendix 1.

4.5 Terrestrial Habitat

No action and alternatives 1A, 1B, 3B, breach alternatives A and B. The proposed project would not affect any terrestrial resources. All the alternatives would impact only water and sea bottom.

4.6 Marine Habitat

No Action. The no-action alternative of leaving the existing harbor without improvements compared with the varying configurations of the harbor alternatives would not significantly increase the impact on the local environment. Impacted resources are locally and regionally abundant. An improved protected moorage area would cause more vessels to use the harbor. Without protection the harbor would be under utilized.

4.6.1 Alternative 1A

The rubblemound breakwater would cover approximately 2.33 acres of marine habitat, converting the substrate from unconsolidated sandy bottom to rocky reef. The bottom is covered with brown algaes. The productivity of this habitat was considered moderate to low for fish. No eelgrass beds would be covered. Rocky reef habitat does provide attachment substrate for algae and sessile organisms and could provide cover and food for fish species. The existing floating breakwater would be replaced with a new floating breakwater. The floating breakwater also would provide habitat for algaes, sessile organisms, and cover for fish. Organisms would colonize the new floating breakwater quickly. The removal of the existing floating breakwater would adversely impact the attached organisms.

The negative impact on biological habitats by the breakwater (i.e., potentially constricting and altering water flow patterns in Settler Cove) has been identified as a concern by the USFWS. Specifically, the concern is with disruption of non-motile fish and invertebrate egg and larvae identified in Section 3, which are entirely dependent on water currents for transportation between offshore spawning grounds and estuarine nursery areas. Short delays in transport can be significant because of critical relationships to available food sources and stages of development. Mortality of eggs and larvae could occur if they become adhered on the breakwater structures. Increased predation could also occur if eggs and larvae are adhered on the breakwater or concentrated in the constricted passage.

This is the same concern identified in the 1977 Port Lions Small Boat Harbor Final EIS. Resource agencies objected to the detached breakwater in the middle of the cove, similar to the breakwater alignment for alternatives 1A and 1B. Additional studies would be needed to fully address this issue if these alternatives were selected as the recommended plan. However, as stated before, the environmental affects are comparable between the alternatives without this data.

4.6.2 Alternative 1B

The two rubblemound breakwaters would have a total footprint of 4.14 acres, converting unconsolidated sandy bottom habitat to rocky reef. The bottom is covered with brown algae. No eelgrass would be covered. This alternative would provide more rocky reef habitat that would in time provide substrate for attachment marine organisms.

Indirect effects to biological resources in Settler Cove caused by constricting water flow patterns discussed in Alternative 1A also apply to this alternative.

4.6.3 Alternative 3B (Recommended Plan)

The curved rubblemound breakwater would have a total footprint of 3.26 acres, converting unconsolidated sandy bottom habitat to rocky reef. The sandy bottom habitat is covered with predominantly brown algae. No eelgrass would be covered. This alternative would provide rocky substrate for colonizing marine organisms similar to the other breakwater alternatives.

The breakwater alignment would be constructed on the west side of Settler Cove and would not further constrict the water body beyond the existing condition.

4.6.4 Breach Alternative A

The detached stub breakwater placed adjacent to the existing breach opening would deflect high tide waves from entering the harbor. The 150-foot-long breakwater would cover 0.56 acres of intertidal and subtidal habitat composed of sand with attached brown algaes. The stub breakwater to narrow the breach opening would cover 0.71 acres. The opening would be reduced from 65 feet to 30 feet.

4.6.5 Breach Alternative B (Recommended Plan)

The breach opening would be reduced similarly to Alternative A by extending the existing breakwater 40 feet shoreward. The additional rubblemound breakwater would cover 0.13 acres of sandy bottom intertidal and subtidal habitat. The stub breakwater to narrow the opening is identical to Alternative A above.

4.6.6 Comparison of Alternatives

Alternative 1A would impact less marine habitat because of the floating breakwater

component to the plan. Floating breakwaters have an environmental advantage because they provide substrate habitat, allow water flow, and also do not restrict movement of fish and other organisms except for surface free-floating organisms. The drawbacks are the structures have a shorter functional life and require more maintenance.

The magnitude of bottom impacts from the rubblemound alternatives 1B and 3B is not significant, only 1 to 2 additional acres of sea bottom would be buried, respectively. The loss of sandy bottom habitat and brown algaes would be compensated by the rocky reef habitat provided by the breakwaters for algae and sessile organism recolonization. The selected plan 3B would cover one more acre of habitat than 1B but would confine the breakwater on the southeast side of the cove rather than placing a breakwater into the channel with unknown consequences. Placing a breakwater in the middle of Settler Cove is not favored by the USFWS because of water flow constriction concerns. The selected breach alternative B accomplishes the same goal of reducing the wave heights into the harbor but with lesser amounts of fill.

4.7 Fish

All Alternatives. Salmonid species are more abundant near shore in summer than at other times of the year. Other fish species use areas near shore at various depths for spawning and juvenile stage rearing, usually during the spring and summer. The abundance and diversity of resident fish species in Settler Cove are considered low to moderate. The harbor project would not adversely affect fish habitat. In-water construction involving breakwater placement would be timed to the least disturbing periods. To lessen the effects, the timing window restricts in-water work during the spring migration period (March 15 through June 15). The breach modifications would allow fish passage at the higher tides. The maintenance of the breach would be dredged as necessary to maintain project depths. Maintenance dredging would adhere to the same in-water work windows to protect fish.

Alternative 1A and 1B potentially have greater indirect effects on fish populations due to egg and larvae recruitment and survivability because of the alternation of water flow in Settler Cove. Additional studies would be needed to determine the full extent of impacts. Alternative 3B would not further constrict the Settler's Cove beyond the existing condition.

4.8 Marine Mammals

4.8.1 No Action and Alternatives 1 through 3, Breach Alternatives.

The existing harbor and the expanded harbor plans would not affect the use of the marine habitat for marine mammals in the area. Correspondence is contained in Appendix 4. Further consultation indicated that a marine mammal monitor was not warranted because the number of seals is judged to be low in the harbor area, especially during construction. Appropriate measures would be taken to avoid injury or harassment to marine mammals during construction.

4.9 Birds

No Action and Alternatives 1 through 3, Breach Alternatives. The bird use of the wetlands at the head of the cove would not be affected by the harbor alternatives. The existing harbor in Settler Cove has not significantly deterred waterfowl from the area.

4.10 Essential Fish Habitat

4.10.1 No Action

The 2 to 4 acres of sandy bottom habitat undeveloped by the expanded harbor would continue to function as moderately productive marine habitat for fish and invertebrates.

4.10.2 Alternatives 1 through 3, Breach Alternatives

The Corps has determined that the described activity would have minimal affect on EFH. Surveys along the shallow near-shore and intertidal areas indicated the eelgrass beds were productive as fish habitat. The harbor alternatives would not directly affect these areas. The deeper water areas were moderately productive for fish. Indirect effects on egg and larvae recruitment and survivability are an issue with Alternatives 1 A and 1B as discussed previously.

4.10.3 Pacific Salmon

Loss of a small amount of kelp habitat and placement of the detached breakwater are not expected to have a significant impact on salmon. Construction impacts would be mitigated by scheduling work to avoid sensitive migration periods.

4.10.4 Rock Sole and Flathead Sole

Harbor construction would displace fish temporarily but would have no effects on habitat or populations.

4.10.5 Pacific Cod

Juvenile Pacific cod were present in the intertidal eelgrass beds in the harbor area. Harbor construction would cause temporary disturbance to surrounding habitats but would have no long-term loss to the eelgrass and associated rearing habitat for cod.

4.10.6 Sculpin

Sculpins are present at the proposed harbor site, and placing a breakwater at the proposed site would displace them during construction. They would re-establish themselves after construction with little overall habitat loss expected.

4.10.7 Red King Crab

No juvenile red king crab were observed at the project site. The breakwater construction would not inhibit habitat use of the area.

4.10.8 Forage Fish

The sand and gravel habitat in the cove would not be impacted for use by forage fish species.

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4.11 Threatened and Endangered Species

All Alternatives. Project construction would not affect the endangered whales or the Steller sea lions that occur in the Kodiak general area. Consultation correspondence is in the USFWS report, Appendix 2 and from the National Marine Fisheries Service in Appendix 4.

4.12 Coastal Zone Management

The Coastal Zone Management Act requires states to make consistency determinations for any federally constructed, licensed, or permitted activity affecting the coastal zone of a state with an approved coastal zone management program (CZMP). Under the Act, the applicants must submit a statement that the proposed activity complies with the state's approved CZMP and will be conducted in a manner consistent with the CZMP. The state then has the responsibility to either concur or object to the consistency determination. Consistency certifications must include the following information:

- A detailed description of the proposed activity and its associated facilities.
- An assessment relating to the probable effects of the proposed and associated facilities to relevant elements of the CZMP.
- A set of findings indicating that the proposed activity, its associated facilities, and their effects are consistent with relevant provisions of the CZMP.

The U.S. Department of Commerce in 1979 approved the Alaska Coastal Management Program (ACMP). The state coastal management policies and guidelines included in the ACMP are intended to be refined by local districts preparing district coastal management plans (CMP). Completed district CMP's must be approved first by the Alaska Coastal Policy Council and then by the U.S. Department of Commerce, either as a routine program implementation or as an amendment to the ACMP. Once approved by the U.S. Department of Commerce, district CMP's become the basis for Federal consistency determinations. The City of Port Lions Coastal Management Plan published in 1979 was consulted in preparation of this evaluation.

4.12.1 Consistency Evaluation

Alaska Coastal Management Program requirements (6 AAC 80)

Uses and Activities.

040. Coastal development

Development approvals are given priority in the following order:

1. water-dependent uses and activities
2. water-related uses and activities; and
3. uses and activities which are neither water-dependent nor water-related for which there is no feasible and prudent inland alternative to meet the public need for the use or activity.

The Port Lions harbor's purpose and need (section 1) is to provide expanded moorage for the local fishing and regional transient fishing fleet. This is a water dependent use and activity. The harbor area would be altered by the addition of breakwaters, creating a calmer water zone behind the breakwaters. Breakwaters would provide attachment substrate for colonizing organisms. The staging area is ancillary to the harbor's function and is upland.

050. Geophysical hazard areas

Port Lions is within an earthquake hazard area.

060. Recreation

The proposed Port Lions harbor would attract and service recreational vessels. The harbor would increase public access to the rich physical and biological resources of the area.

080. Transportation and utilities

The proposed harbor expansion would better serve as a navigation service location providing fuel, communications, limited amenities, and refuge from storms.

100. Timber harvest and processing

Not Applicable

110. Mining and mineral processing

Not Applicable

120. Subsistence

The proposed Port Lions Harbor would benefit local subsistence by providing expanded vessel moorage.

Resources and Habitats

130. Habitats

(1) Offshore areas
(2) Estuaries
(3) Wetlands and tide flats

The proposed Port Lions harbor alternatives are in near-shore shallows and subtidal unconsolidated sea bottom zones. Resources in these habitats are discussed in Section 3. Environmental consequences are discussed in Section 4. The harbor project would unavoidably impact habitat by breakwater construction. The small amount of habitat loss would not adversely affect the surrounding habitat productivity and nutrient cycling. Water quality in the immediate area would be reduced during construction and operation. Tidal exchange would dilute petroleum products released into the harbor. Oxygen levels in the harbor, because of the good tidal exchange, would not be significantly reduced within or outside the harbor. Hydrology and water quality are discussed in Sections 3 and 4.

(4) Rocky islands and sea cliffs
(5) Barrier islands and lagoons
(6) Exposed high-energy coasts
(7) Rivers, streams, and lakes
(8) Important upland habitat

140. Air, land, and water quality

The proposed project would be managed to comply with air and water quality. A harbor management plan would be prepared that enforces Best Management Practices to minimize chronic water pollution. Petroleum spill prevention and containment would be part of the harbor management plan. The plan would also include the containment and disposal of trash and wastes.

150. Historic, prehistoric, and archeological resources

The proposed harbor would have no affect on cultural resources. See Sections 3 and 4.

Other Standards

070. Energy facilities

Not Applicable

090. Fish and Seafood

The proposed harbor would benefit the local commercial fishing fleet and the transient regional fishing fleet by providing moorage and services.

5.0 MITIGATION PLAN

The USFWS prepared a final Coordination Act Report as mandated by the Fish and Wildlife Coordination Act of 1958. This report is in Appendix 2. To minimize adverse impacts to fish and wildlife and their habitats, the USFWS recommendations in their report have been incorporated into the mitigation plan. The near-shore breach for fish passage has been retained as a mitigation measure for the recommended harbor design. The initial scoping and coordination with the agencies and the public have not identified a significant effect to a specific resource associated with the recommended plan and no compensatory mitigation has been identified or can be justified. The unavoidable impacts associated with construction of the recommended plan, Alternative 3B, do not result in significant adverse effects to any of the identified resources in the project site. The mitigation plan effectively avoids and minimizes impacts of the recommended alternative plan to a negligible level.

- Fill activities will not occur during those periods specified by the Alaska Department of Fish and Game or the National Marine Fisheries Service in order to reduce the biological impacts of generated turbidity and suspended sediments on out-migrating juvenile salmon, adult salmon, or Pacific herring.

- Methods will be implemented as necessary to isolate the in-water work area from other marine waters and to filter or settle out silt-laden water (i.e., the use of silt curtains) during breakwater construction.

- Stationary lighting associated with operations of the harbor should be shielded downward in such a way as to minimize the hazard of disorienting flying birds and causing them to strike fixed objects. The Corps has coordinated with the USFWS on the specifications for shielded lighting to be installed by the local sponsor.

- The floating breakwater will not be removed while any Arctic terns are nesting (approximately April 15-1 August).

- The local project sponsor has agreed to develop a Best Management Practices Plan (BMP) for minimizing and preventing water quality impacts from the new boat harbor. The BMP should describe practices to minimize or prevent impacts from vessel maintenance and repair, fuel handling, spill response, handling and disposal of hazardous wastes, solid waste disposal, sanitary waste disposal, bilge water management, and storm water management. A draft of the BMP should be provided to the USFWS for review. The final BMP should be made available to harbor users via the internet or hard copy.

- The local sponsor will install an interpretive sign at the harbor where it is highly visible to the public. The sign should discuss hydrocarbon impacts to fish and wildlife in the marine environment and provide tips to help boaters prevent and report fuel spills. Text for the sign and the final design will be coordinated with the USFWS.

6.0 REQUIRED COORDINATION

6.1 Relationship to Environmental Requirements

This document was prepared under the guidelines of the National Environmental Policy Act, 40 CFR, parts 1500-1508, dated November 29, 1978, as amended. An evaluation to determine consistency with Section 404 (b)(1) of the Clean Water Act, which discusses discharge of dredged or fill material, has been completed. The State 401 Water Quality Certification process reviews the project's compliance with State of Alaska water quality standards under the Clean Water Act.

The Port Lions coastal zone management plan has been reviewed. The proposed project would be undertaken in a manner consistent to the maximum extent practicable with the Alaska Coastal Management Program. This determination is based upon the description of the project and its effects, and upon an evaluation of the relevant provisions of the management program. The Port Lions small boat harbor project would have no effect on any species listed as threatened or endangered. Consultation with the USFWS and the National Marine Fisheries Service has been conducted on listed species under their jurisdiction. Consultation under the Magnuson-Stevens Fishery Conservation and Management Act (MSA) amendments to assess the effects on essential fish habitat has been conducted for the Port Lions project.

7.0 REFERENCES

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APPENDIX 1

EVALUATION UNDER SECTION 404 (b) (1)
CLEAN WATER ACT
Alternative 3B

APPENDIX 2

FINAL
U.S. FISH AND WILDLIFE SERVICE
COORDINATION ACT REPORT

This report constitutes the U. S. Fish and Wildlife Service's Final Fish and Wildlife Coordination Act Report on the U. S. Army Corps of Engineers proposed Small Boat Harbor Improvement Project in Port Lions, Alaska. The purpose of this report is to provide the Corps with planning information to discuss the presence of fish and wildlife resources likely to be affected by the proposed Port Lions Small Boat Harbor Improvement Project; define fish and wildlife resource issues that should be addressed by the study; define potentially significant impacts that could result from meeting study purposes and objectives; and highlight potential measures to mitigate impacts to fish and wildlife and their habitat.

This report is prepared in accordance with the Fiscal Year 2002/2003 Scope of Work and the Fish and Wildlife Coordination Act (48 Stat. 401, as amended: 16 U.S.C. 661 et seq.). This document constitutes the report of the Secretary of the Interior as required by Section 2(b) of the Fish and Wildlife Coordination Act.

The following report is based on information provided by Corps' project biologists Larry Bartlett and Lizette Boyer, a review of pertinent literature, consultation with state and federal biologists, an assessment of potential impacts to known fish and wildlife resources, and site evaluations conducted in 2002.

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List of Figures and Tables

Introduction

The Alaska District of the U.S. Army Corps of Engineers (Corps) proposes to improve harbor facilities in Port Lions, Alaska, by adding additional protection to the fishing fleet and mooring docks from waves and debris that enter the harbor during specific storm conditions. A 600-foot breakwater was completed in 1981; however it was badly damaged by waves that same year. In 1983, the breakwater was extended 125 feet with large armor rock and a 170-foot stub breakwater was built on the south side of the main breakwater. However, the existing breakwaters do not adequately protect the moorage float system from high winds and waves that enter the harbor under certain sea conditions. The Corps identified five alternatives for harbor improvements in Port Lions; three alternatives involve new breakwaters; and two alternatives involve modifications to an existing breach opening. The Corps has identified Alternative 3b and breach Alternative B as the preferred plan.

Formal coordination between the U. S. Fish and Wildlife Service (Service) and the Corps on this project was initiated in February 2002. Biological investigations were conducted in January, March, and July of 2002.

This Fish and Wildlife Coordination Act Report represents the Service's biological investigation and impact assessment of the five alternatives for harbor improvements in Port Lions. The purpose of this report is to discuss fish and wildlife resources in the project area, detail the potential impacts of project alternatives and recommend measures for mitigating those impacts.

Study Area

Port Lions, located on Kodiak Island (Figure 1), is approximately 30 air-miles northwest of the city of Kodiak. The village of Port Lions was established in 1964 after the village of Afognak was destroyed by a tidal wave following the March 27, 1964 earthquake. The proposed alternatives for the Port Lions harbor improvements are located within Settler Cove adjacent to the existing breakwaters and moorage facilities (Figure 2). The existing harbor facilities lie to the northeast of the village of Port Lions. Settler Cove opens to Kizuyak Bay.

Port Lions is located in the maritime climatic zone primarily influenced by strong low pressure systems generated in the Gulf of Alaska and North Pacific Ocean. The average annual precipitation is 54 inches per year. Winter temperatures range from 10° F to 40°; summer temperatures range from 55°F to 70°F. Winter winds in this area are predominantly from the northwest and are stronger than summer winds that predominant from the east. According to Port Lions residents, the severe storms that have caused damage to the harbor usually occur during fall and winter months with winds coming from the northeast. The wave climate in the Port Lions area is characterized as being oriented in one of two directions depending on wind direction; either from the northeast, or from the south. Port Lions tides are generally diurnal with two highs and two lows occurring daily. The mean tide range is 4.9 feet and the extreme range is 14 feet.

Figure 1. Vicinity map of the Port Lions area.

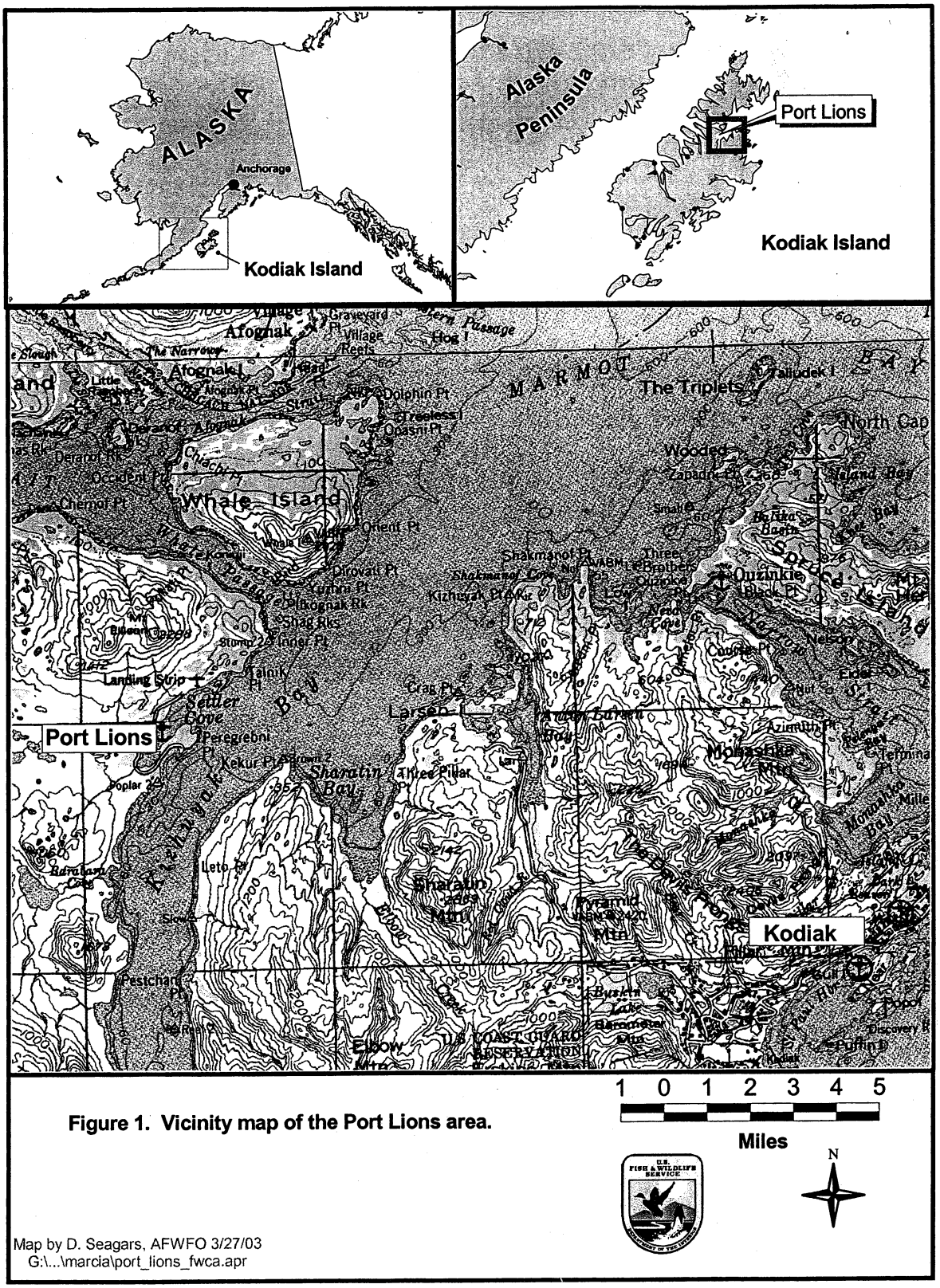

Figure 1. Vicinity map of the Port Lions area.

Map by D. Seagars, AFWFO 3/27/03
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Figure 2. Existing Port Lions Harbor Facilities

Detailed Plan Descriptions for Project Alternatives

The purpose of the proposed Port Lions harbor improvements is to prevent reoccurring storm waves from damaging the float system and vessels in the existing harbor by providing a fully protected mooring area.

The Corps has identified five alternatives (Figures 3-7) for the proposed harbor improvements. Of these alternatives, three are designed to provide additional protection to the mooring basin and two are designed to reduce ocean waves and debris from entering the breach located within the existing breakwater. It is likely that a breach alternative will be coupled with one of the other alternatives in order to protect those areas of the harbor impacted by storm waves. Breakwater size, footprint, and rock quantities are specified for each alternative in Table 1. No blasting is anticipated for any of the alternatives. The Corps has identified Alternative 3b and breach Alternative B as the preferred plan.

Table 1. Specifications of Project Alternatives.

	Alternative 1a	**Alternative 1b**	**Alternative 3b**	**Breach Alternative A**	**Breach Alternative B**
	Detached Breakwater	**Detached Breakwater**	**Detached Breakwater**	**Detached Breakwater**	**Breakwater Extension**
Length	700 ft.	700 ft.	1,160 ft.	150 ft.	40 ft.
Armor Rock	19,600 cy	19,600 cy	29,300 cy	6,000 cy	550 cy
Secondary Rock	12,900 cy	12,900 cy	10,300 cy	8,300 cy	550 cy
Core Rock	25,900 cy	25,900 cy	41,100 cy	6,000 cy	300 cy
Footprint	2.3 acres	2.3 acres	3.26 acres	0.56 acres	0.13 acres
	Floating Breakwater	**Detached Breakwater (SW)**		**Fill Extension**	**Fill Extension**
Length	720 ft.	860 ft.	----------	75 ft.	75 ft.
Armor Rock	----------	7,100 cy	----------	325 cy	300 cy
Secondary Rock	----------	----------	----------	300 cy	300 cy
Core Rock	----------	31,400 cy	----------	1,100 cy	1,100 cy
Footprint	0.3 acres	1.84 acres	----------	0.15 acres	0.15 acres
Dredging Area	----------	----------	----------	----------	----------
Total Footprint	2.6 acres	4.14 acres	3.26 acres	0.71 acres	0.48 acres

Alternative 1a

Alternative 1a (Figure 3) involves construction of a rubblemound breakwater located northeast of the existing breakwater and replacement of the existing floating breakwaters on the southeast side of the harbor with new floating breakwaters. The existing floating breakwater would be removed and disposed of at an upland site. No dredging would be required.

Alternative 1b

Alternative 1b (Figure 4) would consist of two rubblemound breakwaters located northeast and southeast of the existing breakwater. The existing floating breakwater, replaced by one of the rubble mound breakwaters, would be removed and disposed of at an upland site. No dredging would be required.

Alternative 3b

Alternative 3b (Figure 5) would consist of a rubblemound breakwater located in front of the harbor and south of the existing breakwater. The existing floating breakwater would be removed and disposed of at an upland site. No dredging would be required.

Breach Alternative A

Breach Alternative A (Figure 6) involves construction of a 150-foot long detached breakwater and a 75-foot extension of the existing stub breakwater that is located adjacent to the dock. The opening between the proposed detached breakwater and shoreline would form a 30-foot breach. The opening between the main and stub breakwaters would be reduced from 65 to 30 feet. Invert elevations through the breach would remain the same at +5 feet, MLLW. No dredging would be required for this alternative.

Breach Alternative B

Breach Alternative B (Figure 7) involves a 40-foot long extension of the main breakwater and a 75-foot extension of the stub breakwater. The existing breach width would be reduced from 65 to 30 feet. Invert elevations through the breach would remain the same at +5 feet, MLLW. No dredging would be required.

Figure 3. Alternative 1a.

Figure 4. Alternative 1b.

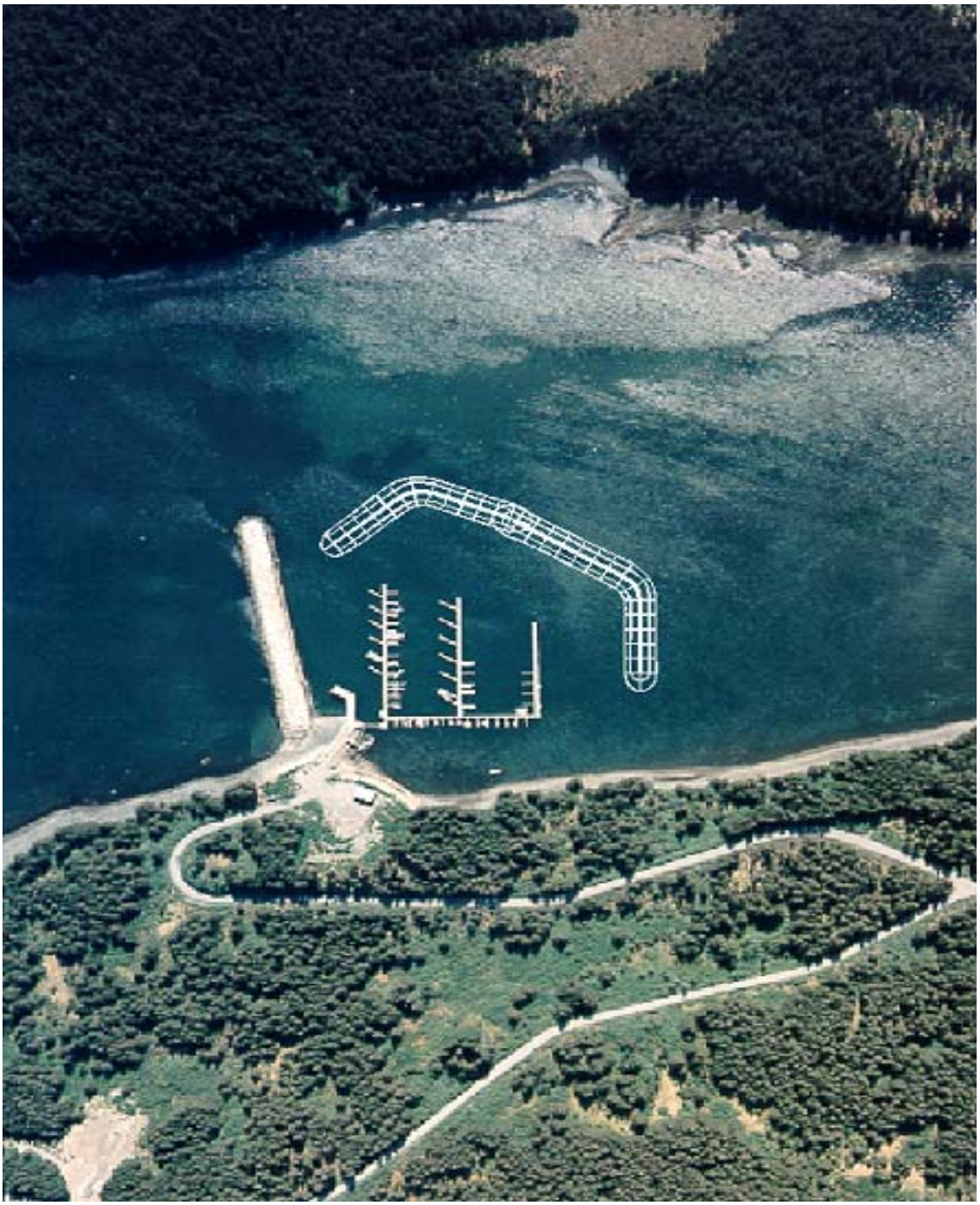

Figure 5. Alternative 3b.

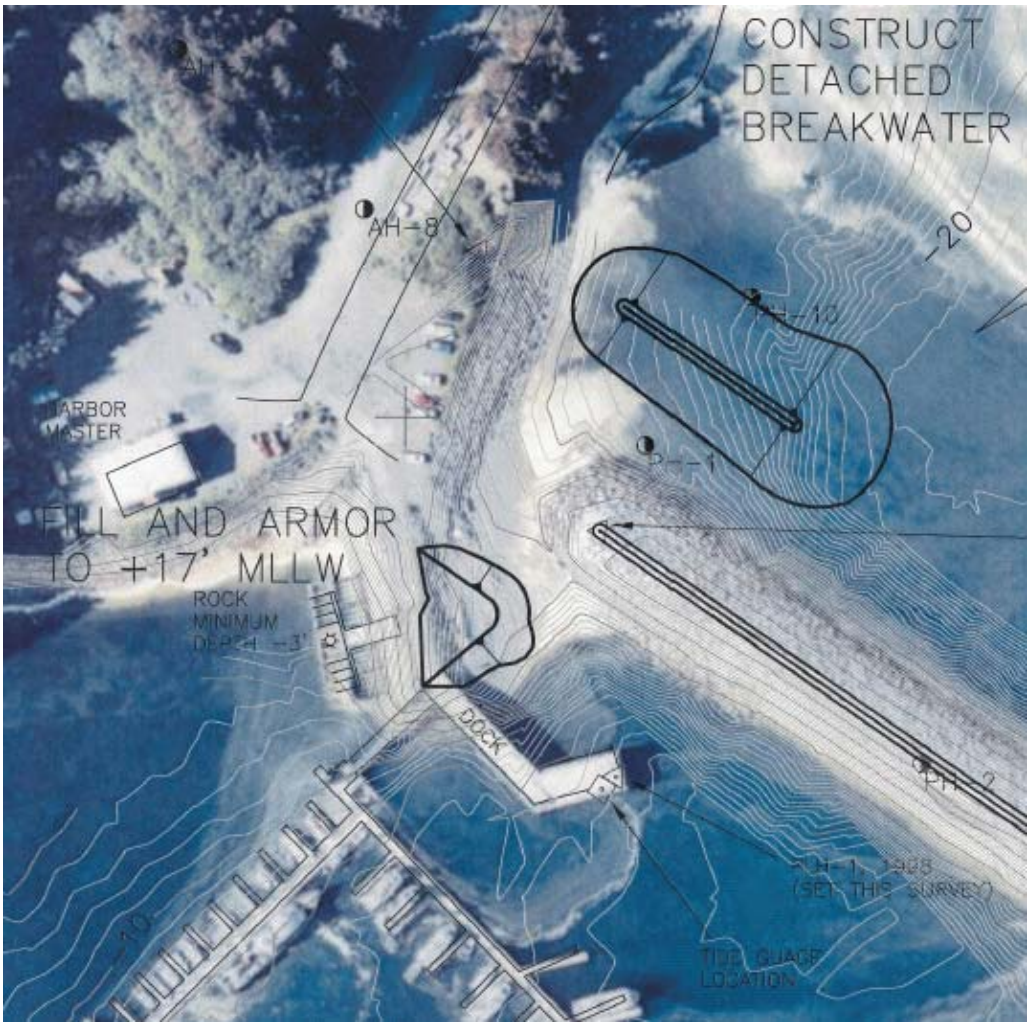

Figure 6. Breach Alternative A.

Figure 7. Breach Alternative B.

Biological Resources

Settler Cove has been identified as a significant system that deserves special attention. As an estuary with mixed habitats, including abundant eelgrass resources, the area is important for nutrient recharge and mixing. It provides spawning, rearing, and larval staging habitat and food resources for numerous species, including invertebrates, fish, birds, and mammals. Within Settler Cove, five different habitats have been identified: wetlands, tidelands, low energy beaches, high energy beaches, and beaches with rocky outcroppings (ESE 1982).

Biological investigations were conducted by the Service and Corps in January, March, and July 2002. Surveys to determine if threatened Steller's eiders and sea otters (a candidate species) occur within or near the project area were conducted during the January and March biological investigations. Biological investigations were also conducted in 1973 in the project area to gather information on fish and wildlife resources for the harbor alternatives proposed at that time (Boughton 1974).

Marine Substrates, Aquatic Vegetation, and Invertebrates

The predominant substrate types that occur in the project area include bedrock, large boulder, and coarse gravel substrates with sparse vegetation that are subjected to severe onshore wave action. There is a bedrock and large boulder base in calmer waters, thus allowing abundant surfaces for holdfast attachment. Protected coves and bays are characterized by soft bottoms of mud, sand, gravel and shell.

Marine plants found near the existing breakwater in 1973 biological investigations include *Cyamathere triplicata*, *Cystophyllum geminatum, Desmarestia aculeata, Halosaccion glandiforme, Nereocystis leutkeana, Fucus furcatus, Laminaria saccharina, Punctaria latifolia, Ulva lactuca, Zosteria marina,* and corraline algae (Boughton 1974).

In 1973, SCUBA dive surveys were conducted in three transects located within or near the area of proposed harbor improvements (Boughton 1974). Invertebrates identified during the surveys are presented in Table 2. Service biologists counted 646, 2- to 3-year-old king crabs within a pod estimated at 1,000 individuals near the causeway in Settler Cove in October 1976 (USFWS 1976). Historically, king crab were an important commercial fishery, however, the population crashed in the early 1980s. According to Alaska Department of Fish and Game (ADF&G) Kodiak Shellfish Biologist Kelly Spalinger (pers. comm. 2003) there has been no commercial fishery for king crab in this part of Kodiak for many years. King crab are rarely detected during trawl surveys conducted in Kizhuyak Bay: however, survey areas are a long distance from the project area. Thus, the status of king crab stocks in the project area is unknown. The Kodiak Island king crab stocks are still depressed and are considered to be in the "re-building" phase. ADF&G has recommended that it may be beneficial to attempt additional SCUBA surveys along the original transects to assess if king crab are still present and at what abundance before construction. Any disruption of king crab habitat should be avoided.

Table 2. Invertebrates documented in Transects 1-3 during 1973 SCUBA dive surveys (Boughton 1974).

	Transect 1	Transect 2	Transect 3
Dungeness crab (*Cancer magister*)			X
Crago alaskensis	X		
Common sand dollar (*Echinarachnius parma*)	X		
Hermit crab *Pagurus tenuimanus*			X
Pagurus sp.	X	X	
Pisaster sp.	X	X	X
Sunflower star (*Pycnopodia helianthoides*)	X	X	X
Green sea urchin (*Strongylocentrotus drobachiensis*)	X		X
Helmet crab (*Telmessus cheiragonus*)	X	X	X
White cap limpet (*Acmea mitra*)	X		
(*Acmea pelta*)	X	X	X
Thatched barnacle (*Balanus cariosus*)	X	X	X
Acorn barnacle (*Balanus glandula*)	X	X	X
Calliostoma sp.	X	X	X
Nuttall's cockle (*Clinocardium nuttalli*)	X	X	X
Oregon triton (*Fusitriton oregonensis*)	X	X	
Black katy (*Katharina tunicata*)	X		
Bent-nosed clam (*Macoma nasuta*)	X	X	X
Sand clam (*Macoma secta*)	X	X	
Blunt gaper (*Mya truncata*)	X		X
Common mussel (*Mytilus edulis*)	X	X	X
New England Neptune (*Neptunea lyrata*)			X
Periwinkle sp.	X	X	X
Alaska falsejingle (*Pododesmus macroschisma*)	X	X	X
Pacific littleneck clam (*Protothaca staminea*)	X	X	X
Butter clam (*Saxidomus giganteus*)	X	X	X
Alaska gaper (*Schizothaerus capax*)			X
(*Schizothaerus nuttalli*)	X	X	X
Pacific razor clam (*Siliqua patula*)	X	X	
Alaska surf clam (*Spisula alaskana*)	X	X	
Fringed dogwinkle (*Thais lamellosa*)			X
Lined chiton (*Tonicella lineata*)	X		
Horse mussel (*Volsella modiolus*)	X		
Bryozoans sp.	X		
Feather duster worm (*Eudistylia polymorpha*)	X		X
Opalescent sea slug (*Hermissenda crassicornis*)	X		X
Red tube worm (*Serpula vermicularis*)	X		X
Spirorbus sp.	X	X	
Sponge sp.	X	X	
Euphausids sp.	X		
Jellyfish sp.		X	X
Plumose anemone (*Metridium senile*)	X	X	X
Metridium sp.	X		X
(*Sarsia mirabilis*)	X		
Tealia sp.	X		X

In March and July 2002, Corps and Service biologists conducted substrate surveys using an underwater video camera in areas where future dredging or filling may occur (Barlett 2002 a&b). Location of the 2002 transects are documented in Figures 9 and 10. Results of the 2002 surveys are included in Appendices A and B. These surveys indicate that areas where the proposed alternatives are located support an abundance of sea life within mixed marine habitat types. These habitats include mud, sand, gravel, and boulder substrates. Dominant marine plants documented during the surveys include *Laminaria*, various species of brown and green kelp, and eelgrass. Areas of eelgrass identified during the 2002 surveys are provided in Figure 11. Eel grass habitat should be maintained as it is highly productive and utilized by the majority of fish and wildlife resources in the area. Invertebrates documented during the 2002 surveys include sea anemones, sea stars, clams, shrimp, sea worms, barnacles, and sand dollars. During the July surveys, millions of *Mysid* shrimp larvae were observed throughout Settler Cove.

The transects along the existing breakwater showed moderate colonization by marine algaes. The breakwater toe was heavily colonized by brown, red, and green marine algaes.

The 2002 surveys included evaluation of the substrate and marine resources under the docks and floating breakwaters in the existing harbor. Marine life within the area of the floating docks was abundant and diverse with animal and plant life attached to the concrete floats and on the substrate underneath the floats. The submerged sides of the concrete floats were heavily colonized with algae, mussels, anemones, and other invertebrates. Several species of jellyfish were detected in the protected waters of the inner cells on the breakwater floats. Schools of fish assumed to be cod, *Mysid* shrimp, *Telmessus* crabs, and anemones were found within the algae attached to the breakwater floats. Brown, green, and red algae, and anemones were attached to the dock substrate. Juvenile cod were abundant in the water column adjacent to the dock and several adult greenling were visible on the bottom. The dock floats were covered with a dense growth of blue mussels, sea anemones, and kelp.

Fish

Three small creeks drain into Settler Cove north of the existing harbor. Settler Creek, at the head of Settler Cove, and Crow Creek provide spawning habitat for coho and pink salmon. Several hundred pink salmon spawn within the intertidal area of Crow Creek (Boughton 1974). Airport Creek supports pink salmon spawning habitat. Marine fish identified during the 1973 investigations are documented in Table 3. Fish were sampled at three different seine sites (Figure 10) in eelgrass habitat during the July 2002 surveys. Seine sets were taken during a 0 tide. Results of the seine sets are documented in Table 4. Juvenile sockeye and coho salmon are stocked into Crescent Lake, which drains into Settler Cove. Outmigrating smolt likely use the inshore marine waters to rear and acclimate to the salinity of the cove, prior to offshore migrations. Adults returning from the stocking projects are harvested by the residents of Port Lions for subsistence. These enhanced fish are the primary source for salmon used by the villagers and the subsistence harvest of enhanced sockeye relieves the harvest pressure on the Barabara Creek wild sockeye salmon stock, which has been depressed in recent years. Pacific herring are also present in Settler Cove.

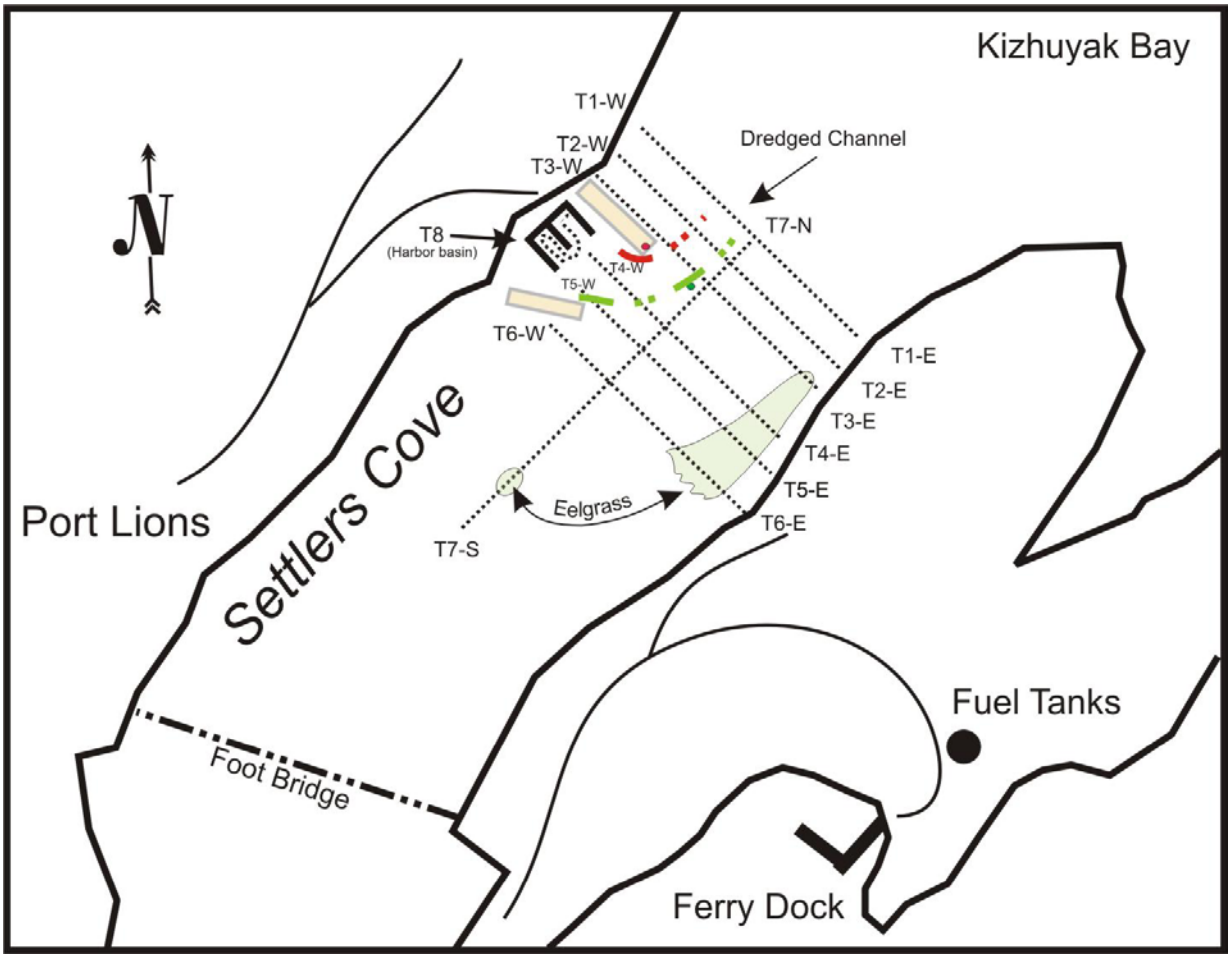

Figure 9. Substrate Transects at Port Lions, Alaska.
Note: Transects were videotaped on March 6, 2002.

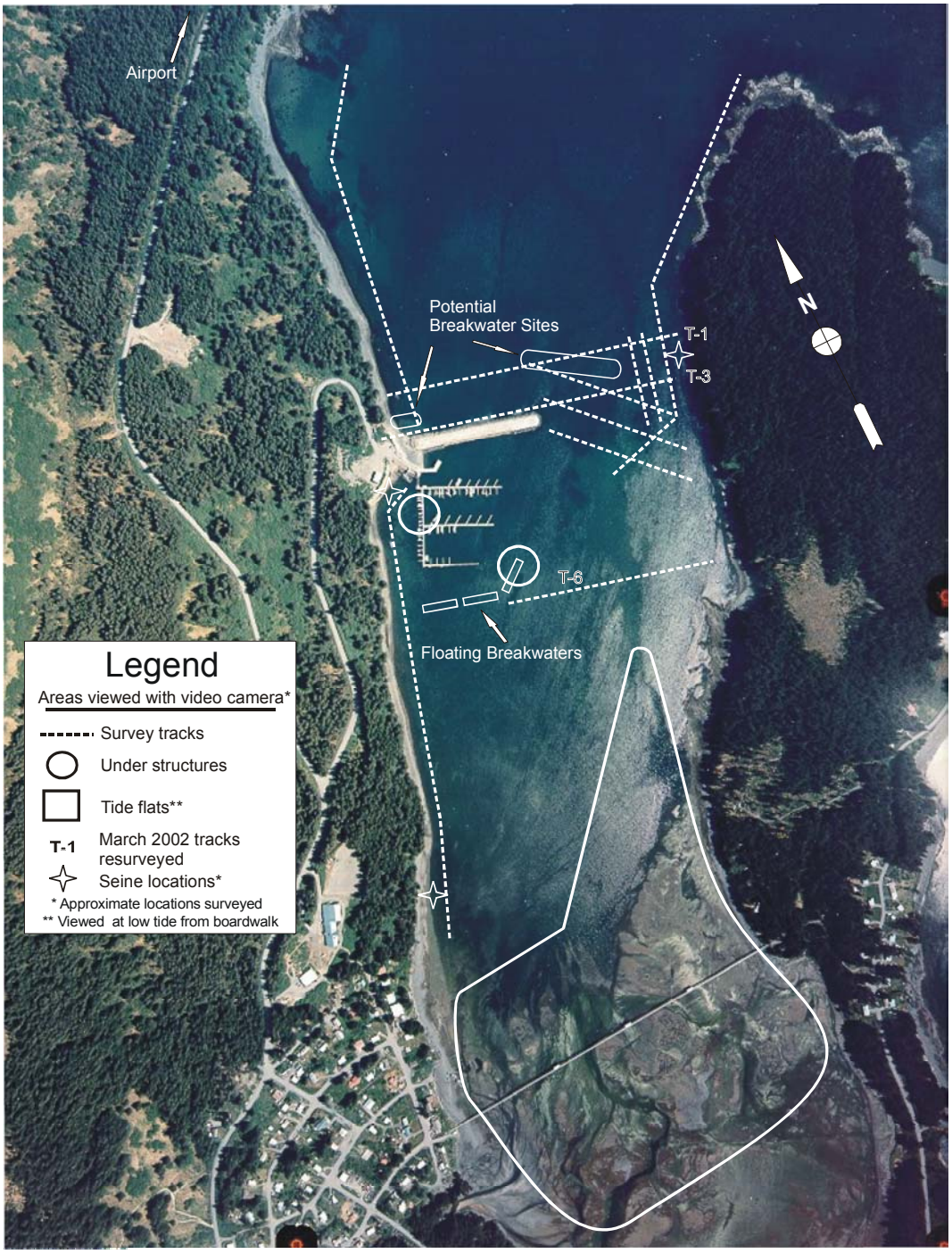

Figure 10. Underwater video camera substrate tracks in Settler Cove.
Note: Substrate tracks were viewed with a video camera during July 15-17, 2002 surveys.

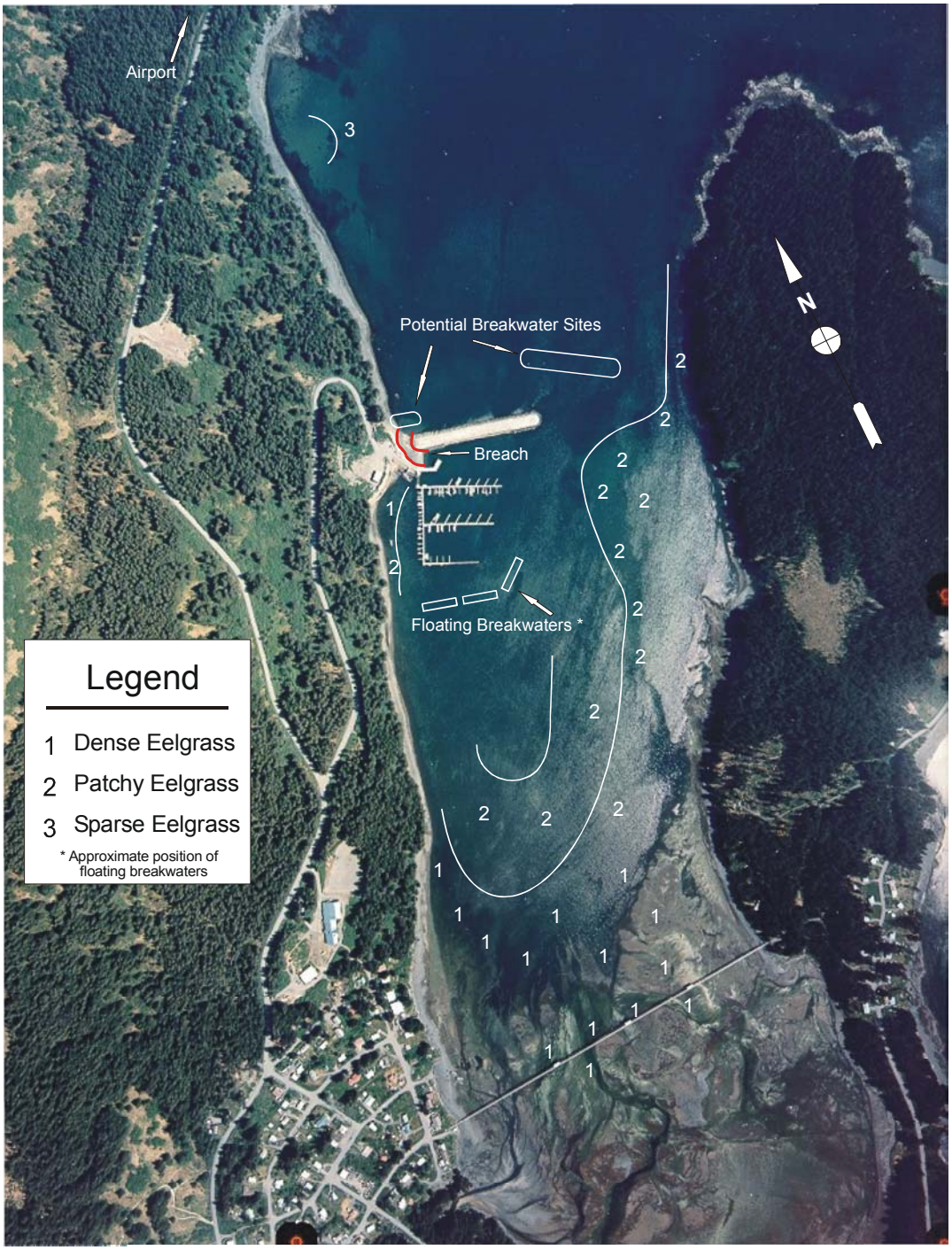

Figure 11. Relative area and density of eelgrass in Settler Cove and Port Lions Harbor.
Note: Based on March 6 and July 15-17, 2002 surveys. Eelgrass coverage on the tide flats was estimated from the boardwalk during low tide.

Table 3. Fish documented in transects 1-3 during 1973 biological investigations.

	Transect 1	Transect 2	Transect 3
Sturgeon poacher (*Agonus acipenserinus*)		X	X
The searcher (*Bathymaster signatus*)	X	X	
Candlefish sp.	X		
Sharpnose sculpin (*Clinocottus acuticeps*)			X
Red Irish lord (*Hemilepidotus hemilepidotus*)	X		
Greenling species (*Hexagrammos sp.*)	X	X	X
Rock sole (*Lepidopsetta bilineata*)		X	X
Great sculpin (*Myoxocephalus polyacanthocephalus*)		X	X
Sculpin sp.		X	X

Table 4. Fish documented in seine sets 1-3 during July 2002 biological investigations.

	Seine Set 1	Seine Set 2	Seine Set 3
Tubesnout (*Aulorhynchus flavidus*) - adult	X	X	
Tubesnout poacher (*Pallasina barbata*)			X
Silverspotted sculpin (*Blepsias cirrhosus*)	X	X	X
Pacific cod (*Gadus macrocephalus*)	X	X	X
Whitespotted greenling (*Hexagrammos stelleri*)	X	X	X
Masked greenling (*Hexagrammos octogrammus*) - adult		X	
Kelp greenling (*Hexagrammos decagrammus*)		X	
Rock greenling (*Hexagrammos lagocephalus*)		X	
Great sculpin (*Myoxocephalus polyacanthocephalus*)			X
Tidepool sculpin (*Oligocottus maculosus*) - adult?			X

Note: All fish are juvenile unless indicated.

Birds

Birds identified within five different survey segments (Figures 12 and 13) during the 2002 biological investigations are displayed in Tables 5 and 6. The more abundant species identified during these surveys include mallard, greater scaup, long-tailed duck, black scoter, pelagic cormorant, harlequin duck, and common goldeneye. The largest number of birds within a transect were found at the head of Settler Cove where biologically rich food sources are abundant. Locations of major species concentrations identified during the 2002 surveys are identified in Figures 9 and 10. The number of waterfowl that use Settler Cove increase during fall and winter months. Some duck hunting occurs in this area by local residents and visitors.

No bald eagle nests were observed in the vicinity of the harbor during 2002 field investigations; however, numerous bald eagles were documented feeding and perching in the Settler Cove area. The nearest seabird colony is located approximately 3 miles from the harbor and supports 400 black-legged kittiwakes. One Arctic tern was documented nesting on the most eastern floating breakwater that runs parallel to the shoreline (Figure 14). The nest was on exposed rebar from

the deteriorated concrete float located at the south end of the breakwater. Other species detected within or near the existing harbor facilities include gulls and cormorants. Several were observed resting on the floating breakwaters during the winter, along with a few pigeon guillemot. The most common birds observed in Port Lions during 1973 biological investigations include mew and glaucous-winged gull, northwest crow, varied thrush, fox sparrow, pelagic cormorant, harlequin duck, greater scaup, and white-winged scoter (Boughton 1974).

Table 5. Birds and marine mammals identified during January 17, 2002 wildlife surveys

	Segment 1	Segment 2	Segment 3	Segment 4	Settler Cove	**Totals**
Red-necked grebe	6		9			15
Grebe species					1	1
Loon species		1				1
Mallard					22	22
Gadwall					2	2
Greater scaup	4	1			161	166
Long-tailed duck	59	33	82	26	4	204
Black scoter	2	47	10	6	6	71
Surf scoter			3			3
Pelagic cormorant	14	27	29	10	36	116
Harlequin duck			18	7		25
Common goldeneye		5	3		56	64
Common merganser					6	6
Red-breasted merganser					28	28
Bufflehead					8	8
Common murre	14	18	5	1		38
Sea otter			3	10		13
Harbor seal					1	1
Totals	99	132	162	60	331	

Note: See Figure 12 for survey locations.

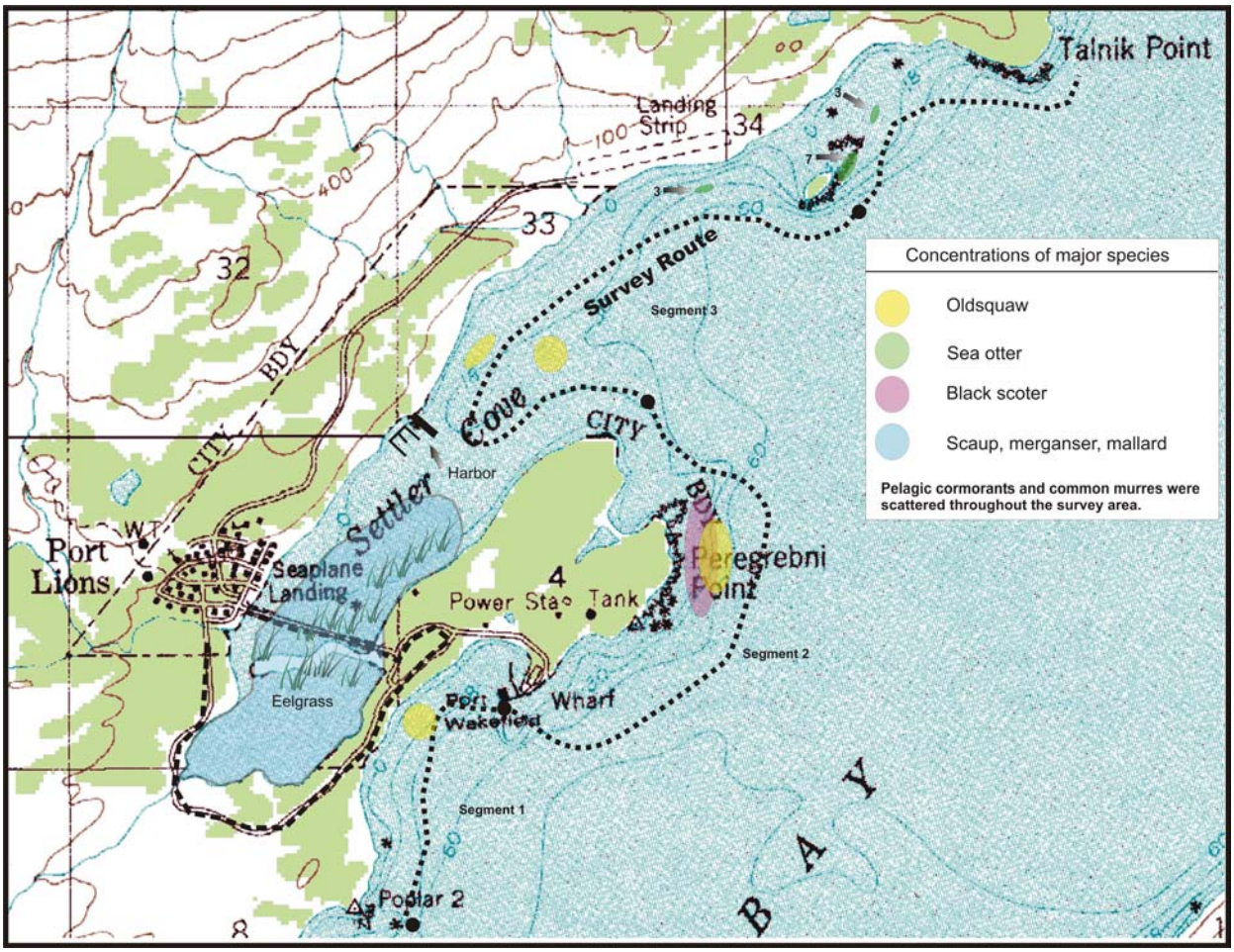

Figure 12. Survey route (Poplar 2 to Talnik Point) during January 7, 2002 Steller's eider survey of Port Lions, Alaska.
Note: Concentrations of major species are also shown.

Table 6. Birds and marine mammals identified during March 5, 2002, wildlife surveys

	Segment 1	Segment 2	Segment 3	Segment 4	Settler Cove	Totals
Red-necked grebe			1			1
Mallard					290	290
Greater scaup	2	2	8		1	13
Scaup species			38		209	247
Steller's eider		1				1
Long-tailed duck	85	13	82	6	2	188
Black scoter	11	74	62	25	7	179
Surf scoter	2		26	12		40
Cormorant species	25	25	71	14	31	166
Harlequin duck	9	10	71	35	3	128
Common goldeneye	10	1	11	13	47	82
Common merganser					4	4
Red-breasted merganser			8		31	39
Bufflehead	1		5		17	23
Pigeon guillemot	6	15				21
Murrelet species	1	3		5		9
Murre Species		2		3		5
Sea otter				4		4
Totals	152	146	383	117	642	

Note: See Figure 13.

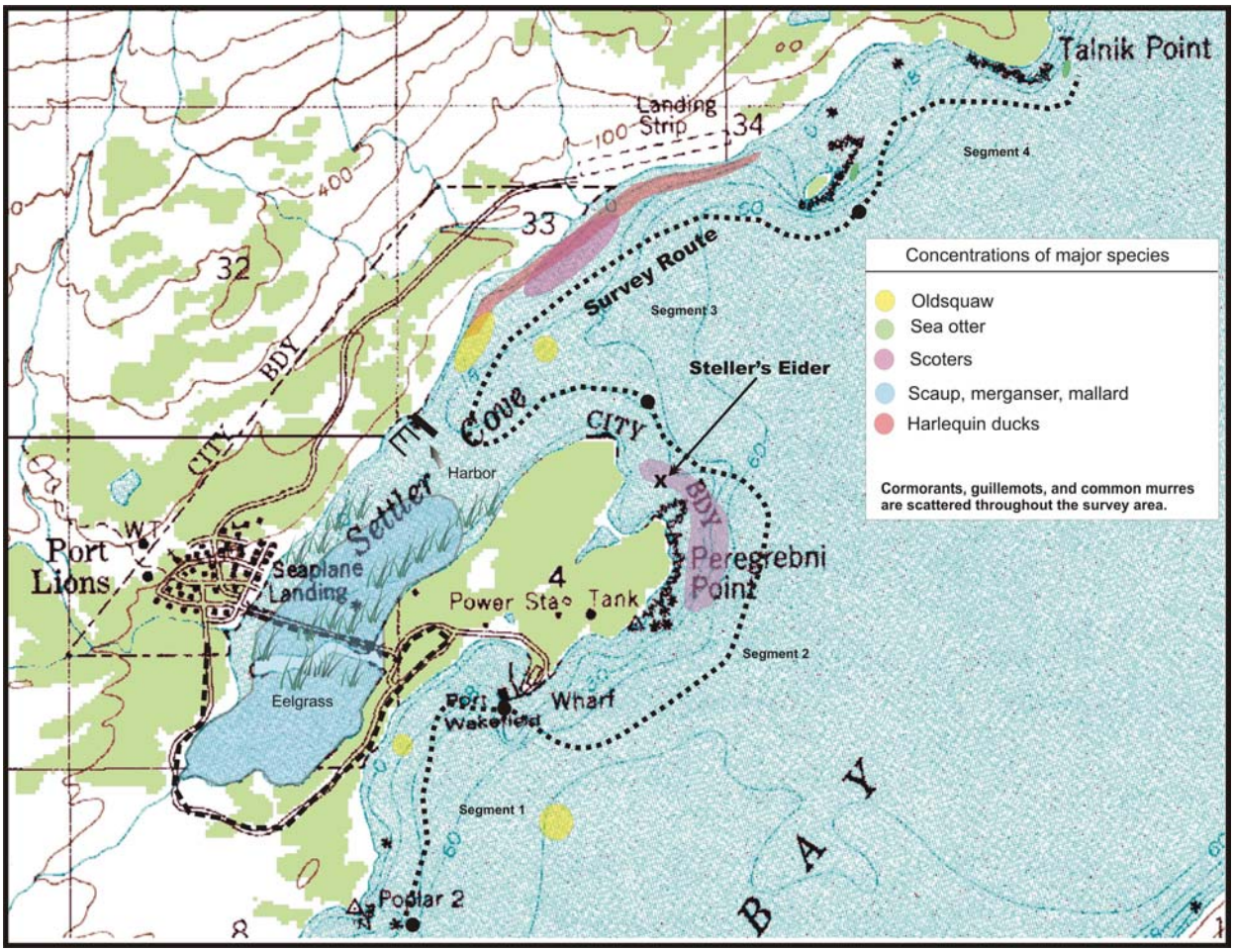

Figure 13. Locations of major species concentrations and location of Steller's eiders.
Note: Information from March 5, 2002 sea duck survey at Port Lions, Alaska.

Figure 14. Arctic tern nest on floating breakwater.

Terrestrial and Marine Mammals

Land mammals native to Kodiak Island include brown bear, red fox, river otter, short-tailed weasel, little brown bat, and tundra vole. Introduced mammals found near Port Lions include black-tailed deer, beaver, snowshoe hare, mink, red squirrel, and marten.

Harbor seals (*Phoca vitulina*) and sea otters (*Enhydra lutris*) are the marine mammals most commonly found near the proposed project area; however, Steller's sea lions and northern fur seal are occasionally found in Settler Cove and the Port Wakefield vicinity. There are no sea lion rookeries or haul outs out near the proposed alternatives. During the 2002 surveys, sea otters were mostly observed east of Settler Cove near a small island surrounded by reefs (Figures 12 and 13).

In 1994 and 2001, aerial surveys for sea otter were conducted within the Kodiak archipelago by the Service's Marine Mammals Management Division, using the methods of Bodkin and Udevitz (1999). The survey method does not allow for calculation of estimates for individual areas, only for the entire archipelago. Those estimates are 9,817 ±5,169 (1994) and 5,894 ±2,630 (2001). In the Port Lions area, 25 otters were sighted in three groups in 1994 in Kizhuyak Bay, and no

otters were sighted in 2001. A little further east in Sharatin Bay, a single otter was sighted in1994, and eight otters were sighted in five groups in 2001. Looking at the sighting data, the density of sea otters in the Port Lions area is rather low, as compared to places like Kupreanof Strait and Raspberry Strait to the north.

Threatened and Endangered Species

Steller's eiders have been reported in the thousands around Kodiak Island during winter. Although no survey data are available for Kizhuyak Bay, local knowledge indicates that the waters near Port Lions are not used by Steller's eiders (Denny Zwiefelhofer, Wildlife Biologist, Kodiak NWR, pers. comm.). Steller's eiders do use nearby Afognak and Raspberry Straits commonly during winter, but numbers have declined in recent years, reportedly due to increased human settlement in the area.

The sea otter has recently been listed as a candidate species. The Aleutian sea otter population has been experiencing severe declines in the central portion of its range and the magnitude and extent of this decline is unknown. The population status is undetermined for the Kenai and Alaska Peninsulas, lower Cook Inlet, and Kodiak Island.

Biologists from the Corps Environmental Resources Section conducted a wildlife survey (Figure 12) of Settler Cove and Kizhuyak Bay on January 7, 2002. The survey was conducted to determine if Steller's eiders and sea otters occur within or near the area of the proposed harbor project. On March 5, 2002, the survey was repeated (Figure 13) with the addition of staff from the Service. A few sea otters were observed as documented in Tables 5 and 6. One male Steller's eider was identified during the surveys. The eider was found north of Peregrebni Point (Figure 13) outside of the area where harbor improvements are proposed.

Best available information suggests that there are no federally listed or proposed species or designated or proposed critical habitat within the action area of the proposed project. Therefore, Corps section 7 responsibilities under the Endangered Species Act have been satisfied. However, obligations under section 7 of the Endangered Species Act must be reconsidered if new information reveals project impacts that may affect listed species or critical habitat in a manner not previously considered or if this action is subsequently modified in a manner which was not considered in this assessment. Future correspondence regarding this project and the Endangered Species Act should refer to consultation number 2003048.

This information relates only to federally listed or proposed species or designated or proposed critical habitat under the Service's jurisdiction. It does not address species under the jurisdiction of the National Marine Fisheries Service (NMFS).

Future Resource Conditions Without the Project

Without the project, the Service would expect resource conditions to remain largely as they are today. Consequently, the habitat is likely to generally remain in its current condition.

Future Resource Conditions With the Project

In the Service's evaluation of the impacts related to the proposed alternatives, we assume that one of the breach alternatives would be built in combination with one of the other alternatives, based on information provided by Corps project biologists.

Impacts Related to Rubblemound Breakwater Construction

Habitat losses and alterations will occur within and adjacent to the footprint of any proposed rubblemound breakwater. Construction may cause short-term reductions in water quality due to the suspension of sediments during material placement. The proposed breakwaters will bury and smother existing plants and colonized invertebrates causing direct mortality. The constructed breakwater will, over time, provide habitat for marine organisms, but the degree of and time for recolonization cannot be predicted. Based on information provided by the Corps (Table 1), Alternative 1b would result in the largest area of direct impacts related to habitat losses and alterations from construction of the breakwater (4.14 acres) and Alternative 1a would result in the smallest area of impacts (2.6 acres). Alternative 3b would impact 3.26 acres of habitat. Breach Alternative A would impact 0.71 acres and Breach Alternative B would impact 0.48 acres of habitat. Based on 2002 substrate surveys, none of the proposed alternatives occur within documented areas of eelgrass habitat.

Alternatives 1a and 1b would place the breakwater across Settler Cove channel near the existing breakwater. Location of the existing breakwater has created a narrower channel and placement of the Alternative 1a or 1b breakwater will further constrict the channel. This design could alter existing tidal circulation patterns, water velocity, sediment deposition, and flushing actions. This in turn could alter marine habitat, disrupt life cycles, and restrict or change species use within portions of Settler Cove. The extent or significance of these potential changes is unknown without further pre- and post-project monitoring.

Of particular concern is disruption of fish and invertebrate egg and larvae transport. Transport of invertebrate and fish eggs and larvae are almost entirely dependent on water currents for transportation between offshore spawning grounds and estuarine nursery areas. Further constriction of the existing channel and altered patterns of water flow caused by the proposed breakwater structures in Alternatives 1a and 1b may adversely affect egg and larval transport of fish and invertebrates. Even short delays in transport can be significant because of critical relations to available food sources and the stage of development. It is possible that mortality of eggs and larvae could occur if they become stranded on the breakwater. If breakwater constriction causes eggs and larvae to be concentrated in a narrow passage or become stranded on the breakwater, predation of these species could increase.

Settler Cove has been described as a highly productive and diversified marine habitat by NMFS and other resource agencies (DOA 1977) and potential habitat degradation in this area is of particular concern. When the outer breakwater (main breakwater now proposed in Alternatives 1a and 1b) was proposed as part of the original project in 1976, both the Service and NMFS expressed concerns that the outer breakwater could result in significantly altered circulation patterns causing adverse impacts to the highly productive ecosystem in Settler Bay (DOA 1977). Placement of the rubblemound breakwater across the main channel of Settler Cove in

Alternatives 1a and 1b would increase impacts to the same area that concerned Service and NMFS biologists in 1977. The location of the existing breakwater further compounds our concerns because placement of another breakwater will further constrict the channel.

Modeling of Settler Cove circulation patterns, with and without the proposed breakwaters, was conducted in 1976 by the Coastal Engineering Research Center as part of the original project design and environmental impact statement. The Service and NMFS were concerned the proposed breakwaters would have a negative effect on circulation patterns, which would change salinity and freshwater dilution in the cove. (The original harbor design had two breakwaters similar to the 1a and 1b alternatives). Also of concern were the added input of harbor related pollutants and the lack of dispersion of sewage from the community septic outfall closer to the head of the bay. The model showed that the tidal prism of Settler Cove is not affected by the placement of the breakwaters. The tidal prism is the volume of water that is exchanged within the basin or water body during any tidal cycle. Surface currents due to the tides would be altered only in the vicinity of the breakwaters. The streams flowing into Settler Cove would not be changed by the project nor would surface currents generated by these streams be changed. Therefore, salinity would be unchanged. Current mathematical models done by ADOT&PF also indicate that the breakwaters cause only localized eddies and gyres in the immediate harbor area. The sewage outfall is no longer discharged into Settler Cove. A new piped system bypasses Settler Cove and empties into Kizhuyak Bay.

Alternatives 1b and 3b would replace the existing floating breakwaters located on the southeast side of the harbor with a rubblemound breakwater. The underwater video substrate surveys conducted in 2002 show that a diverse and productive micro-habitat has become established within the structures of the existing floating breakwater. Fish and invertebrate habitat is provided in the cavities within the structures of the floating breakwater and attached marine vegetation. The exposed surface of the floating breakwater is used by birds for loafing, feeding and nesting. Floating breakwaters have reduced environmental impacts compared to rubblemound breakwaters. Some of the environmental benefits of floating breakwaters include minimizing loss and alteration of marine habitat, providing a substrate for plants and invertebrates to become established, providing some fish habitat, and better maintenance of existing water circulation patterns, littoral transport, and fish passage. However, rubblemound breakwaters also provide habitat for marine organisms.

Breaches and Fish Migration Impacts

The breach in the existing breakwater helps maintain nearshore fish migration. A solid fill breakwater extending from shore to deep water can interrupt nearshore anadromous fish migration. Sloped topography, unconsolidated rocks and sediments, vegetation, fresh water seeps, and shallower habitat along the shoreline provide juvenile fish with important rearing and migration habitat. This nearshore habitat provides food, and escape cover that helps protect salmon fry from predation by larger fish. The placement of inwater structures, such as breakwaters adjacent to the shore, will force juvenile fish that migrate along the shore further seaward, where predatory fish are more abundant than in shallower nearshore waters. The steeper slopes typically associated with breakwater structures may also result in increased predation of juvenile salmon because no habitat is available where they can hide. In addition, fish forced to go around the breakwater structures, are susceptible to increased wave action and

turbulence. Juvenile fish could also be more susceptible to predation if they are forced out into deeper water to avoid construction impacts such as increased turbidity.

Breach Alternative A adds a new, detached breakwater along the shoreline and Breach Alternative B extends the existing breakwater 40 feet towards the shoreline. The breach remaining under each of these alternatives would be 30 feet in width, less than half the width of the current breach of 65 feet. If sediments fill in the breaches, fish passage could be jeopardized.

Some juvenile fish, salmon in particular, either prefer or become trapped within some harbor configurations (Cardwell and Koons 1981). Juvenile salmon may seek the protective cover of the floating breakwaters, finger floats, and vessel hulls. This behavior would bring them into close proximity to sources of petroleum compounds and other contamination from vessels in the harbor, where concentrations of toxic materials would be greatest. These effects are directly related to the harbor design and its proximity to salmon migration routes.

Fish are exposed to spilled oil through contact with dissolved petroleum compounds or particles of oil dispersed in the water column, ingestion of contaminated food or water, and through contact with surface oil. Juvenile fish are more sensitive to contamination. Sublethal effects of oil on fish include changes in heart and respiratory rates, enlarged livers, reduced growth, fin erosion, a variety of biochemical and cellular changes, and behavioral responses (Albers 1991).

Alternatives 1a, 1b, and 3b will not interfere with fish passage. Alternative 3b could potentially increase hydrocarbon exposure to fish and invertebrates because the entire breakwater is rubblemound and it surrounds the mooring facilities, however water circulation should be adequate for this design. Breach Alternative A includes construction of a detached breakwater with a 30-foot opening between the breakwater and shoreline. This alternative also reduces the existing breach from 65 to 30 feet to accommodate the 75-foot extension of the existing stub breakwater. Breach Alternative B involves extension of the existing main breakwater and a fill extension. These extensions will reduce the existing shoreline opening from 65 to 30 feet. Breach Alternatives A and B could potentially interfere with fish passage if, over time, sediments fill in the openings between the breakwater and shoreline. The local sponsor is required to maintain the breach opening to the required depth. Breach Alternative A has the potential to cause more impacts to fish passage because it adds an additional structure close to the shoreline.

Additional Impacts

Removal of the existing floating breakwater could violate the Migratory Bird Treaty Act if the tern continues to nest there and the breakwater is removed during nesting season (April 15-August 1).

Comparison of Alternatives

Alternative 1b requires the greatest amount of fill (4.14 acres). Alternatives 1a and 1b both involve placing the breakwater into the channel of Settler Cove, thereby causing increased channel constriction and a potentially negative impact on biological resources. In addition, under Alternatives 1a and 1b, the total footprint of harbor development would be expanded further out

into Settler Cove. Under Alternative 3b the new breakwater would be contained within an area of existing harbor development.

Recommendations

Under the Fish and Wildlife Coordination Act (48 Stat. 401, as amended: 16 U.S.C. 661 et seq.), the Service is responsible for identifying potential project impacts and recommending actions that would mitigate negative project effects on fish, wildlife, and their habitats

Habitat impacted by the proposed harbor improvements within all of the alternatives is of high to moderate value and is relatively abundant in the region (Resource Category 3). Based on the Service's Mitigation Policy (FR Vol. 46, No. 15, January 23, 1981) our mitigation goal for projects within Resource Category 3 habitat is no net loss of habitat value while minimizing loss of in-kind habitat value. In order to meet these goals, we have the following recommendations to mitigate the potential adverse impacts of the project on fish and wildlife resources and the habitats on which they depend.

Recommended Alternatives

Due to our concerns over potential long-term impacts to the marine environment from channel constriction that would occur with placement of the rubblemound breakwater in Alternatives 1a and 1b, we find these alternatives to be the most damaging. Alternative 1b is of greater impact than Alternative 1a because it replaces the southeast floating breakwater with a rubblemound breakwater.

The Corps' preferred plan is Alternative 3b. We believe that a modified version of Alternative 3b (that retains the existing floating breakwaters on the southeast side) would be the least damaging alternative if the existing floating breakwaters are structurally sound and can continue to protect the southeast part of the harbor for years to come. If these breakwaters need to be replaced, then we would recommend replacement with floating breakwaters on the southeast side and a rubblemound breakwater in front of the mooring facilities. Such an alternative was presented to the Service as Alternative 3a at a November 20, 2002, meeting, however, it was eliminated from the final selection of alternatives. Another benefit of modified Alternative 3b, or alternatives 3b and 3a, is that they contain harbor development closer to existing development, whereas, Alternatives 1a and 1b spread the harbor development further out into Settler Cove, and they constrict the main channel.

For the breach alternative, we recommend Breach Alternative B because it requires less fill than Breach Alternative A.

If Alternative 1a or 1b is selected, we will recommend additional compensatory mitigation and studies to assess biological impacts of the channel constriction. To determine the type of studies to be conducted and appropriate options for compensatory mitigation, we recommend formation of a team that includes staff from the Service, Corps, NMFS and ADF&G.

Preliminary Recommendations to Avoid, Minimize, and Compensate Impacts

1. Fill activities should not occur during periods specified by the Alaska Department of Fish and Game or the National Marine Fisheries Service in order to reduce the biological impacts of generated turbidity and suspended sediments on outmigrating juvenile salmon, adult salmon, and herring.

2. Methods should be implemented to isolate the in-water work area from other marine waters and to filter or settle out silt-laden water (i.e., the use of silt curtains) during breakwater construction.

3. Stationary lighting associated with operation of the proposed boat harbor should be shielded downward in such a way as to minimize the hazard of disorienting flying birds and causing them to strike fixed objects. The Corps should coordinate with the Service on the specifications for shielded lighting to be installed by the local sponsor.

4. The floating breakwater should not be removed while Arctic terns are nesting (approximately April 15-August 1).

5. The Corps should require the local project sponsor to develop a Best Management Practices (BMP) Plan for minimizing and preventing water quality impacts from the new boat harbor. The BMP Plan should describe practices to minimize or prevent impacts from vessel maintenance and repair, fuel handling, spill response, handling and disposal of hazardous wastes, solid waste disposal, sanitary waste disposal, bilge water management, and storm water management. A draft of the Plan should be provided to the Service for review. The final BMP Plan should be made available to harbor users via the internet or hard copy.

6. An interpretive sign should be installed at the harbor in a location where it is highly visible to the public. The sign should discuss hydrocarbon impacts to fish and wildlife in the marine environment and provide tips to help boaters prevent and report fuel spills. The sign contractor should work with the Service to develop text for the sign, and the Service should be consulted regarding the final design.

7. The Corps, in consultation with State and Federal resource agencies, should develop and implement a plan to fully mitigate through on-site or off-site compensation, unavoidable impacts associated with breakwater construction.

8. If project design alternatives or the preferred plan change, the Corps should reinitiate consultation with the Service under the Fish and Wildlife Coordination Act.

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Appendix A

CEPOA-EN-CE-ER
MEMORANDUM FOR RECORD

BY: LARRY D. BARTLETT
General Biologist
Environmental Resources Section

SUBJECT: Trip Report, Port Lions Substrate Videotape Survey July 15-17, 2002.

1. **Background.** The U.S. Army Corps of Engineers (Corps) is studying the feasibility of providing additional protection to the fishing fleet and mooring docks at Port Lions, Alaska, from waves that enter the harbor under certain sea conditions. Additional protection to the harbor would most likely come from additions to the existing breakwater or placement of a second breakwater. A team of two Corps biologists and one U.S. Fish and Wildlife Service biologist visited Port Lions 15-17 July, 2002, to characterize the environment in areas that might be impacted by the harbor improvements. Their findings are reported in this memorandum.

2. **Environment**. The Port Lions area has two general types of nearshore marine habitat: (1) deep water exposed to wave action and mostly characterized by large rocks and boulders at the base of steep cliffs (bull kelp (*Nereocystis*) is a common sight along this type of shoreline), and (2) coves and bays characterized by soft bottoms of mud, sand, gravel and shell. Brown and green algae are common in this type of habitat, and eelgrass is found in the shallower areas with muddy bottoms.

a. The harbor area is in the second type of habitat. A freshwater creek flows into Settler Cove at its head, and judging by the ripples in the unvegetated areas on the bottom and visible currents on the surface, there is a vigorous exchange of water in Settler Cove with each tide cycle. The closest NOAA tide station is at Kodiak where average mean high higher water (MHHW), as estimated for Ouzinkie (20 miles from Port Lions), is 9.1 feet with a mean range of 7.0 feet.

3. **Transportation.** The survey team consisted of two Corps biologists and one Fish and Wildlife Service biologist. We flew to Kodiak and Port Lions by commercial airline. In Port Lions we rented a 16-foot skiff and a 15 horsepower engine to do the survey.

4. **Methods.** We videotaped the substrate along transects in the areas that might be impacted by the most likely alternative for placement of an additional breakwater.

a. We used a weighted underwater video camera to view the substrate environment. The camera was lowered near the bottom and the skiff moved along transects at idle speed. We viewed and videotaped the environment as necessary.

b. We resurveyed transects 1, 3 and 5 (originally surveyed in March 2002) because the substrate along these transects would most likely be covered by a new breakwater in mid-channel, and a stub breakwater from the west shore. We compared the July survey of

these transects to the March survey to note any apparent changes in the type of marine vegetation present.

c. We surveyed several transects parallel along a potential breakwater site at the mouth of Settler Cove because a breakwater at this site is likely the preferred alternative.

d. For each transect we noted the latitude and longitude of the starting and ending positions, but the transect track is not necessarily a straight line between points because of wind, tide, and steerage drift.

e. We seined three areas that have eelgrass, one in the existing harbor, one near the head of Settler Cove, and one on the east shore opposite the existing harbor with a 30 x 6-foot seine of ½ inch mesh to document the species of fish that use the eelgrass beds for habitat.

f. We visually looked for and asked local residents if there were any eagle nests in the harbor area.

g. We surveyed about ½ mile along the west shoreline north of the harbor and the east shoreline from the northwest head of Peregrebni Point south into Settler Cove to estimate where eelgrass was growing in the subtidal zone.

h. We photographed areas of Settler Cove at low tide to characterize the extent of eelgrass coverage.

3. **Results and Discussion.** The main objective of the survey was to view the substrate composition and epifauna in the areas that might be covered by placement of a breakwater in mid-channel and possible placement of a stub breakwater on the west shore to dampen wave action through the fish-passage breach (figure 1). We also wanted to see if any changes in marine vegetation and biota were evident since our last survey in March. Secondary objectives were to: (1) characterize fish species that might be using the eelgrass (*Zostera marina*) beds near the harbor for a summer nursery, (2) estimate the area of eelgrass growth in Settler Cove, and (3) establish whether bald eagles (*Haliaeetus leucocephalus*) were nesting in the vicinity of the project.

a. **Transects 1 and 3.** We resurveyed transects 1 and 3 (figure 2) from shore to shore to detect any changes in marine vegetation and biota that might be apparent between the March (winter) and July (summer) surveys. Transect 2 was not resurveyed because transects 1 and 3 were sufficient to cover the likely area of the preferred alternative breakwater. The water was cloudy in the deeper part of transects 1 and 3 because strong wave action the day before the survey may have clouded the water. Never the less, visibility was good enough to see that the vegetation type present during March, when the water was very clear, was the same type during the summer survey. Marine vegetation in this subtidal zone consisted mostly of broad-bladed brown alga in the genus *Laminaria*, *Desmarestia*, and *Cymathere*, but other forms of brown, red and green algae were also present.

b. A portion of transect 3 parallels the existing breakwater. Subtidal boulders along the toe of the breakwater were heavily colonized by several species of brown, green and red marine algae, anemones, and snails.

c. Significant numbers of sea stars, mainly the multi-rayed *Pyconpodia*, were visible on transects 1 and 3 during the winter when much of the substrate was exposed. The substrate on these transects during the July survey, however, was too matted with blades of brown algae to see many sea stars. Some *Pyconpodia* were visible in the few areas of substrate the blades of algae did not cover. Sea stars are likely present under the algae mat in the same density during summer as they were during winter. Sea stars of the genus *Evasterias* are also present in Settler's Cove, but in fewer numbers than *Pyconpodia*.

d. Few fish are visible on the videotapes of transects 1 and 3. Fish on the tape of transects 1 and 3 were juvenile cod (*Gadus or Microgadus sp.*) and adult greenling (*Hexagrammos sp*.).

e. Invertebrates observed on the transect 1 and 3 tapes consisted of small snails, anemones, and crustaceans. Snails included several small species in the families Trochidae, Turbinidae, and Littorinidae. Anemones on the substrate of transects 1 and 3 appeared to be specifically flower anemones of the family Metridiiae. Small crustaceans that appeared to be Mysid shrimp (Mysidacea) were very dense along transect 1 and 3. Clouds of *Mysis* to about ½ inch long were visible hovering near the bottom some areas. Clams and other bivalve invertebrates appear to be abundant in the softer substrate types. A few Telmessus crabs (*Telmessus cheiragonus*) and shed carapaces of Telmessus crabs were noted, but they do not seem particularly abundant in the area.

f. Several small patches of eelgrass were noted near the east terminus of transect 3. This eelgrass was also seen during the March survey, but during this survey it was denser and taller, and covered with epiphytic growth. The eelgrass along this outer shoreline of Settler Cove grows sparsely in a narrow band within about 20 to 30 yards of the high tide line on the east shore.

g. **Transect 6** of the March survey (figure 2) was resurveyed during this survey. The substrate vegetation was the same type and covered the same areas, as during the March survey, only there was a lot more of it. The substrate off the end of the floating dock where transect 6 started was mostly brown algae. This covering of algae continued east across the cove to where it gradually gave way to eelgrass in the shallows on the east side of Settler's Cove. As seen during the March survey, open areas of sand between thick patches of eelgrass were densely populated with greenspined sand dollars (*Echinarachnius parma*).

h. **Potential breakwater site**. We surveyed the substrate along a course where we estimated the preferred breakwater would be (figure 1). The mid sections of transects 1, 2, and 3, cross this area, but this is the first time we surveyed along its length. Marine growth on the substrate was the same as we saw on transects that crossed the area. The bottom was mostly covered with broad-bladed brown algae. Invertebrates consisted of anemones, Mysid shrimp, an occasional sea star, and clams. No fish or eelgrass was seen

in the preferred breakwater area.

i. **Docks and floating breakwaters.** We surveyed under the docks and under the floating breakwaters in the existing harbor (figure 1). The substrate and water column under the docks and floating breakwaters appear to be rich in marine life when compared to some other areas of Settler Cove. The substrate we looked at under the docks was covered with brown, green and red algae, and anemones. Juvenile cod were relatively abundant in the water column and several adult greenlings were immediately visible on the bottom. The dock floats are covered with a dense growth of blue mussels, anemones of several species, and kelp.

Marine life on and around the floating breakwaters appears to be exceptionally rich. Animal and plant life attached to the concrete floats, on the substrate under the floats, and on the deck of the floats, abounds. The submerged sides of the concrete floats were heavily colonized with algae, mussels, anemones, and other invertebrates that make up a rich subtidal marine community. Several forms of jellyfish were abundant in the protected waters of the inner cells on the breakwater floats. The algae attached to the floats grows long tentacles that extended toward the bottom, and schools of juvenile fish, assumed to be cod, were visible among the growth. Algae covered the bottom under the breakwater floats where Mysid shrimp, Telmessus crabs, and anemones were abundant. Large cod schooled under the floating breakwaters and large greenlings appeared abundant on the bottom.

The deck of the floating breakwaters also provided a resting area for gulls and a nesting site for a pair of Arctic or Aleutian terns (*Sterna sp*.). A relatively large colony of cormorants (*Phalacrocorax sp.)* used these breakwaters during the winter, but the only marine birds (excluding gulls) in Settler Cove during this survey were a few pigeon guillemots (*Cepphus columba*), and they do not use the floating breakwaters.

j. **Seine survey.** We made three seine sets in eelgrass beds to characterize the marine life that might be using the eelgrass beds as habitat (table 1). The first set was in a dense area of eelgrass inside the harbor basin. This set produced fish in more numbers than the two sets made outside the harbor basin. Juvenile cod, two species of juvenile greenlings, and juvenile silver spot sculpin (*Blepsias cirrhosus*) were relatively abundant in eelgrass inside the harbor basin. Several tubesnouts (*Aulorhynchus flavidus*) were captured and a small, brown, eel-like fish, possibly a blenny, prickleback or a gunnel, escaped.

We made the second seine set in dense area of eelgrass along the west shore of inner Settler Cove about ¼ mile from the harbor. Unlike eelgrass in the first set, this eelgrass appeared to be uninfluenced by the harbor. This set produced more of the same juvenile species, but fewer in number. This set also produced an adult greenling about 8-inches long. A skip-molt Telmessus crab was also captured by hand on this site.

We made the third set across the cove from the harbor. A few juvenile cod, juvenile silver spot sculpins, juvenile whitespot and kelp greenling, a tubenose poacher (Pallasina barbata), and a small great sculpin (Myoxocephalus polyacanthocephalus) about 10

inches long were caught. Several small tidepool sculpins (*Oligocottus maculosus*) were also caught in this set.

k. **Coverage of eelgrass in Settler Cove.** We attempted to map the coverage of eelgrass in Settler's Cove visually, with the video camera, and with a GPS (figure 2). In general, eelgrass is limited in habitat outside the breakwater along the west shoreline toward the airport, and vary sparse. We found a few thin patches growing (figure 1) outside Settler Cove, but undoubtedly eelgrass grows in other places where conditions allow. Inside Settler Cove along the west shoreline, eelgrass grows densely in the harbor basin, but appears restricted to a narrow band about 20 to 30 feet wide in an area of soft substrate along the shore.

We saw no eelgrass for about ¼ mile along a rocky stretch of the west shore from the harbor basin toward the head of the cove. Substrate conditions change fronting the main settlement of Port Lions, and eelgrass once again grows in profusion. Eelgrass grows almost continuously on suitable habitat on the submerged tidal flats at the head of Settler Cove and about 2/3 of the way along the east shore (figure 1) after which growth appears limited to patches on suitable substrate within about 75 feet of shore. We found no eelgrass growing where we estimated a breakwater would be placed, but there is eelgrass growing in a narrow band along the east shore in the general area inshore of where we estimated a breakwater would end.

l. **Marine mammals.** Sightings of sea otters (*Enhydra lutris*) were relatively common along the outer edge of the harbor near the floating breakwaters. The number of sea otters seen resident in the area during winter (13 otters) is likely representative of the local population. One sea lion (*Eumetopias jubatus*) was seen swimming about 200 yards off the mouth of Settler Cove.

4. Conclusions. Based on this site visit we concluded:

a. A dense mat of mostly by brown algae covers the substrate that might be covered by a breakwater across the mouth of Settler Cove (figure 1). Invertebrates on the bottom consist of sea stars, anemones, clams, a few Telmessus crabs, and during summer, a large biomass of what appear to be Mysid shrimp. Benthic fish are present during summer and appear to be composed of the occasional greenling, cod, and sculpin. Cod are commercial species while greenling, and some species of sculpin, are sport and subsistence species.

b. The breakwater would cover no eelgrass, but the east end of the breakwater would approach a narrow band of eelgrass growing out to about 75 feet from shore. It is likely that some foraging area currently used by sea otters to capture clams and an occasional crab would be covered.

c. The harbor basin at Port Lions appears to be a rich marine environment. Marine vegetation and invertebrates attached to the docks and on the bottom under the docks are abundant. Fish (greenling and cod) also appeared to be relatively abundant under the docks compared with more open areas.

d. A dense (in summer) eelgrass bed inside the harbor basin appears to be a rich nursery environment based on the diversity of species and numbers of individuals found there.

e. The floating breakwaters that border the harbor basin appear to support a very rich marine biota of algae, invertebrates, fish, and birds. Local residents do not tie boats to, store supplies on, or otherwise use the floating breakwaters

f. The subtidal rocks of the outer breakwater are heavily colonized with marine algae and invertebrates.

g. The substrate that would likely be covered by a stub breakwater designed to dampen wave action and tidal surge through the fish passage breach is mostly sand interspersed with cobble. The cobble is colonized by brown algae. Eelgrass is not present.

h. Settler Creek at the head of Settler Cove has a pink salmon (*Oncorhynchus gorbuscha*) run of no more than 1,000 fish that are mostly intertidal spawners (Kevin Adkins, personal communication). The fry of this stock outmigrates through the harbor basin in May and early June. The sockeye salmon (*O. nerka*) run in Settler Creek is introduced (Kevin Adkins, personal communication), but a small run of coho salmon (*O. kisutch*) is native (COE 1977).

i. Bald eagles appear to be more abundant at Port Lions in summer than during winter. Presumably many of the bald eagles seen at Port Lions during summer fly to Kodiak during winter to take advantage of the fish processing plants found there. There are presently no bald eagle nests at Port Lions, but there may be some at the head of Kizhuyak Bay (Kevin Adkins, personal communication). The majority of the bald eagles seen at Port Lions were juveniles.

j. The head and eastern shore of Settler Cove is a rich and diverse marine and brackish water environment that includes eelgrass, marine algae, clam beds, salmon spawning grounds, a diverse population of fish (during summer), and a diverse population of waterfowl (especially greater scaup (*Aythya marila*) and mallard (*Anas platyrhynchos*)), birds, including flocks of northwestern crows (Corvus caurinus), and Sitka black tailed deer (*Odocoileus hemionus sitkensis*) during winter. Assuming the pink salmon are intertidal spawners (Kevin Adkins personal communication), a majority of a year class of Port Lions River pink salmon would be incubating under the intertidal gravel at the head of the cove during winter.

5. **Lessons learned.** The GPS signal received by a hand-held GPS receiver (Garmin Map 12) is not accurate enough to plot the boundaries of eelgrass in a confined space such as Settler Cove (table 2). An alternative method is simply to estimate the boundaries on an aerial photo, such as in figure 1, from field notes and on-site experience.

6. **Personal communication**

Kevin Adkins, personal communication. Port Lions resident, Owner of Kodiak Wilderness Outfitters and Lodge, Hunting Guide, Commercial Fisherman, Sport Fishing charter operator.

7. **Literature Cited**

COE 1977. Final Environmental Impact Statement, Port Lions, Alaska. Dept. of the Army. Office of the Chief of Engineers. Washington, D. C. June 1977.

Figures:

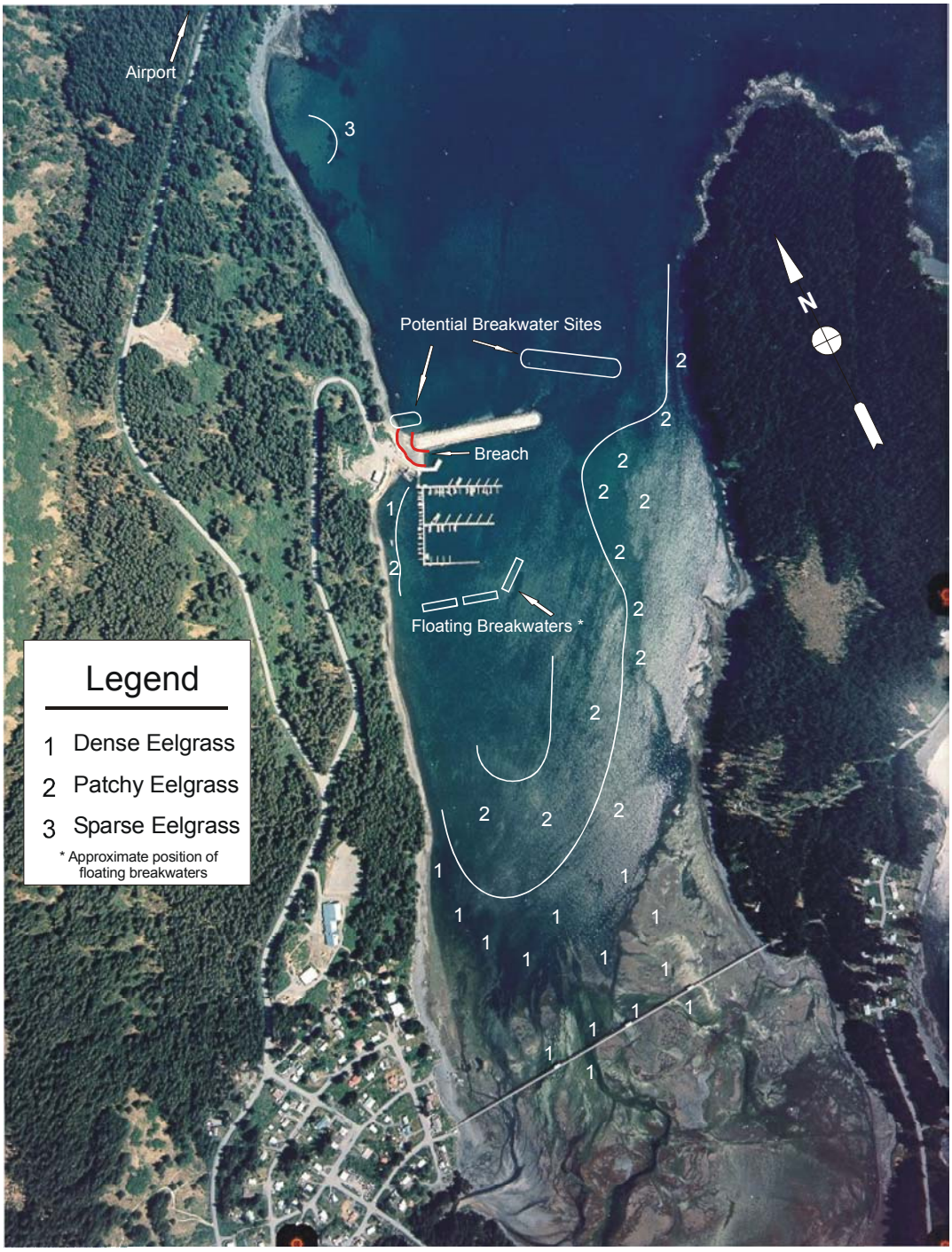


Figure 1. Settler Cove and the Port Lions harbor with the relative area and density of eelgrass estimated from field observations taken during March 6 and July 15-17, 2002.

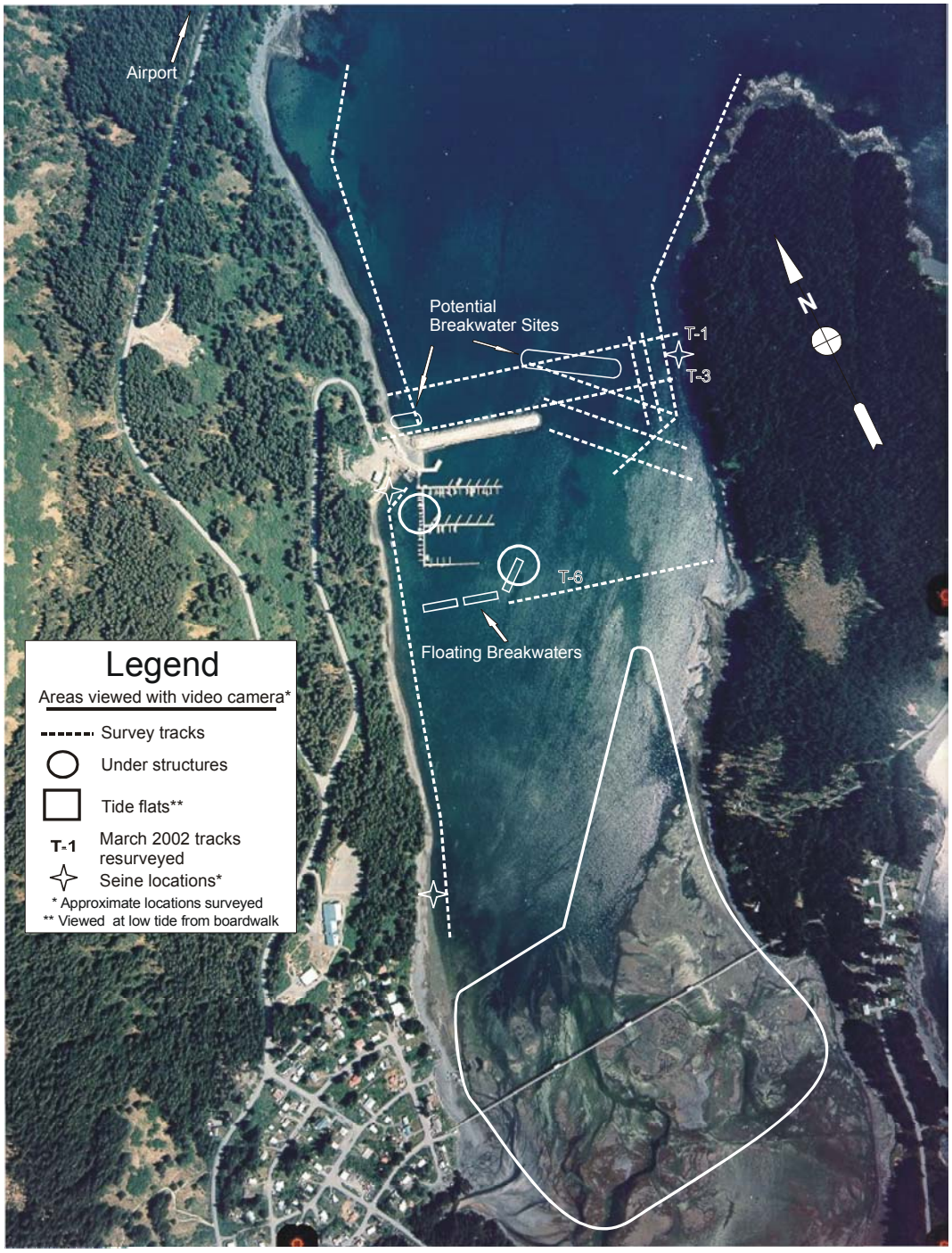


Figure 2. Approximate tracks on which the substrate was viewed with an underwater video camera in Settler Cove and the Port Lions harbor during July 15-17, 2002. Eelgrass coverage on the tide flats was estimated from the boardwalk during low tide. Approximate seine sample locations are indicated.

Table 1. The latitude and longitude of seine sets in Settler Cove and the number of fish by species captured. The number of fish captured and the species composition is only an index of representative species present because some small fish were seen to escape through the mesh ½ inch mesh of the seine. Seine sets were taken during a 0 tide. All fish are juvenile unless indicated.

Set #	North Latitude	West Longitude	Species	Number
1	57 52.377	152 52.134	Sliver spot sculpin	5
Comment: water temp. 13.5° C			Cod species	49
			Tubesnout (adult)	2
			Whitespot greenling	5
Comment: eel-like fish (blenny, prickleback?) about 8 inches long escaped from seine				
2	57 52.121	152 52.522	Masked greenling (adult)	1
			Cod species	4
			Silver spot sculpin	15
			Whitespot greenling	19
			Kelp greenling	1
			Tubesnout (adult)	3
			Rock greenling	9
Comment: One-skip molt helmet crab (*Telmessus cheiragonus*) caught in eelgrass after set.				
3	57 52.148	152 51.636	Tubesnout poacher (adult)	1
			Great Sculpin (adult)	1
			Silver spot sculpin	7
			Cod species	4
			Hermit crab	1
			White spot greenling	1
			Tidepool sculpin (adult?)	4

Table 2. Latitudes and longitudes of eelgrass seen growing in Settler Cove at Port Lions. These positions do not represent the extent of eelgrass growing in Settler Cove and the variance inherent in civilian GPS signals is to wide to accurately define the boundaries of eelgrass growth.

North Latitude	West Longitude	Comment
57 52.235	152 51.556	Eelgrass found
57 52.223	152 51.569	Eelgrass denser
57 52.204	152 51.655	Eelgrass found
57 52.207	152 51.658	Eelgrass mixed with brown algae
57 57.239	152 51.626	Eelgrass (85 meters offshore, 284 meters from end of breakwater)
57 52.141	152 51.668	Eelgrass found
57 52.155	152 51.723	Eelgrass found
57 52.160	152 51.740	Eelgrass found
57 52.164	152 51.756	Eelgrass found
57 52.170	152 51.775	Eelgrass found
57 52.184	152 51.807	Eelgrass found (patchy)
57 52.275	152 51.473	Eelgrass found
57 52.292	152 51.476	Eelgrass found (43 meters offshore)
57 52.279	152 51.492	Eelgrass found
57 52.260	152 51.513	Eelgrass found (patchy)
57 52.269	152 51.560	Eelgrass found (patchy, 21 meters offshore)
57 52.261	152 51.515	Eelgrass found
57 52.118	152 51.516	Start of eelgrass on east shore going into cove
57 52.775	152 51.609	Eelgrass found (sparse)
57 52.764	152 51.600	Eelgrass found (sparse)
57 52.757	152 51.648	Eelgrass found (sparse)
57 52.745	152 51.645	Eelgrass found (getting thicker)
57 52.776	152 51.470	Eelgrass found
57 52.385	152 52.055	Eelgrass (dense) in harbor near grid
57 52.311	152 52.239	Eelgrass in harbor (patchy)
57 52.117	152 52.495	End of eelgrass in harbor going into cove (south)

Appendix B

CEPOA-EN-CE-ER
MEMORANDUM FOR RECORD
BY: LARRY D. BARTLETT
General Biologist
Environmental Resources Section

SUBJECT: Trip Report, Port Lions Steller's Eider Survey; March 5, 2002.

1. **Background.** The U.S. Army Corps of Engineers (Corps) is considering constructing an additional breakwater, or an extension to the original breakwater, at the small boat harbor at Port Lions, Alaska. This would provide additional protection to the fleet and mooring docks from waves that enter the harbor under certain sea conditions. A team of two Corps biologists and one U.S. Fish and Wildlife Service biologist visited Port Lions on March 5, 2002, to conduct the second of two environmental surveys in the harbor area. The purpose of the surveys was to index the presence and abundance of a threatened sea duck, the Steller's eider, and a candidate marine mammal species, the sea otter.

2. **Methods.** The March 5, 2002, survey was conducted from a 26-foot cabin boat (figure 1) along a planned survey route (figure 2). The survey area includes the area on either side of the harbor entrance that might be disturbed by a fishing vessel entering or leaving the harbor. The biologists noted all species of ducks, sea ducks, sea birds and marine mammals in the survey area. Gulls were not included in the survey.

The survey was conducted at idle speeds. The three survey biologists were experienced with the identification of sea duck and seabird species. One Corp biologist covered the seaward side of the vessel and the other covered the shoreward side. The Fish and Wildlife Service biologist assisted the Corps biologists from the aft deck. Distance from shore varied from about 200 to 400 yards. The biologist surveying the seaward side covered the entire bay out to a point where sea ducks and other marine birds could be accurately identified with 8x42 binoculars. This distance was approximately ¼ mile seaward of the boat. The biologist on the shoreward side covered the survey area between the boat and the shore. Total distance surveyed was up to approximately ½ mile from shore. The boat operator positioned the boat so the sun was behind the observers. The biologists positioned themselves on the foredeck of the boat to maximize visibility. Observations were recorded on tape and later transcribed to field notebooks.

3. **Results and Discussion.** A total of 1,436 mixed ducks, sea ducks and sea birds, and 4 sea otters and 2 harbor seals were observed and counted during the survey (table 1). The survey area was represented by two general habitat types: (1) outer waters exposed to wave shock and characterized by little or no shallow littoral zone and areas of brown algae, mostly the genus *Nereocystis*, *Petalonia*, and *Desmarestia*, and (2) the inner Settlers Cove area characterized by a sand, mud, and shell substrate covered with patchy growths of brown and green algae, and eel grass. These habitats are occupied by species that have relatively little overlap with other species, with the exception of cormorants who like to rest on the floating breakwater in Settlers Cove (table 1).

a. The dominant species present during this survey was the common mallard (290). Mallards were a common sight feeding along the water line in inner Settlers Cove. The second-most common was two species of scaup ducks (260): the greater and lesser scaup. These bay ducks gathered in relatively large groups in mid to inner Settlers Cove, where they were seen eating eelgrass. The blades of eelgrass seen floating on the surface of Settlers Cove are likely rooted up from the bottom by this species. Scaup duck were also present outside Settlers Cove, but in lower numbers. Most of the scaup ducks were the greater scaup species. Other species common to Settlers Cove were cormorants, golden eye ducks, red-breasted mergansers, and bufflehead ducks. The cormorants mostly rested on the floating breakwater in the small boat harbor.

b. The dominant species observed in the outer habitat type was the oldsquaw sea duck (188), followed by black scoter (179) cormorants (166), and Harlequin ducks (128). Other species were observed in lesser numbers (table 1). One male Steller's eiders was seen along a kelp bed in the outer habitat near the entrance to Settlers Cove (figure 2).

c. We also saw several murrelets over deeper water along the survey track. Although most were too far away to positively identify, the Fish and Wildlife Service biologist thought there might have been Kittlitz murrelets among those observed. The Kittlitz murrelet is not listed as threatened or endangered, but is a species of concern.

d. We saw four sea otters near the island east of Settlers Cove (figure 1). We saw fewer sea otters (4) on the March 5 survey than we saw on the January 7 survey (13), but they were in the same general location (figures 2 and 3). Sea otters range to forage and other sea otters that may be in the Port Lions area during the January survey could have been foraging outside the survey area during the March survey.

e. We saw two harbor seals offshore of the airport.

4. **Conclusion.** We saw one male Steller's eider during the survey as noted on figure 2. Although the Port Lions area does not have much of the shoal type habitat that Steller's eiders prefer, we were not surprised to see a Steller's eider in the area. Steller's eiders winter in large flocks near Kodiak and migrate to staging areas along the Bering Sea side of the Alaska Peninsula starting in about March. Although Steller's eiders are not known to winter in the immediate Port Lions area, the presence of an occasional Steller's eider along the migration route during March or early April should be expected.

a. A principal reason Steller's eiders do not winter in the Port Lions area could be because of the type of shoreline that dominates the area. Excluding Settlers Cove, the shoreline near Port Lions is mostly steep with almost none of the shoal-type habitat Steller's eiders prefer.

b. We saw sea otters on the small rocky reef on the east end of the island near the airports during the January and March surveys. Although we saw fewer sea

otters during the March survey, this island area is likely important as a congregating and resting area for sea otters.

c. The inner Settlers Cove area is occupied mostly by bay and puddle ducks, and red-breasted mergansers.

Figures:

Figure 1. The survey vessel, Kuber Point.

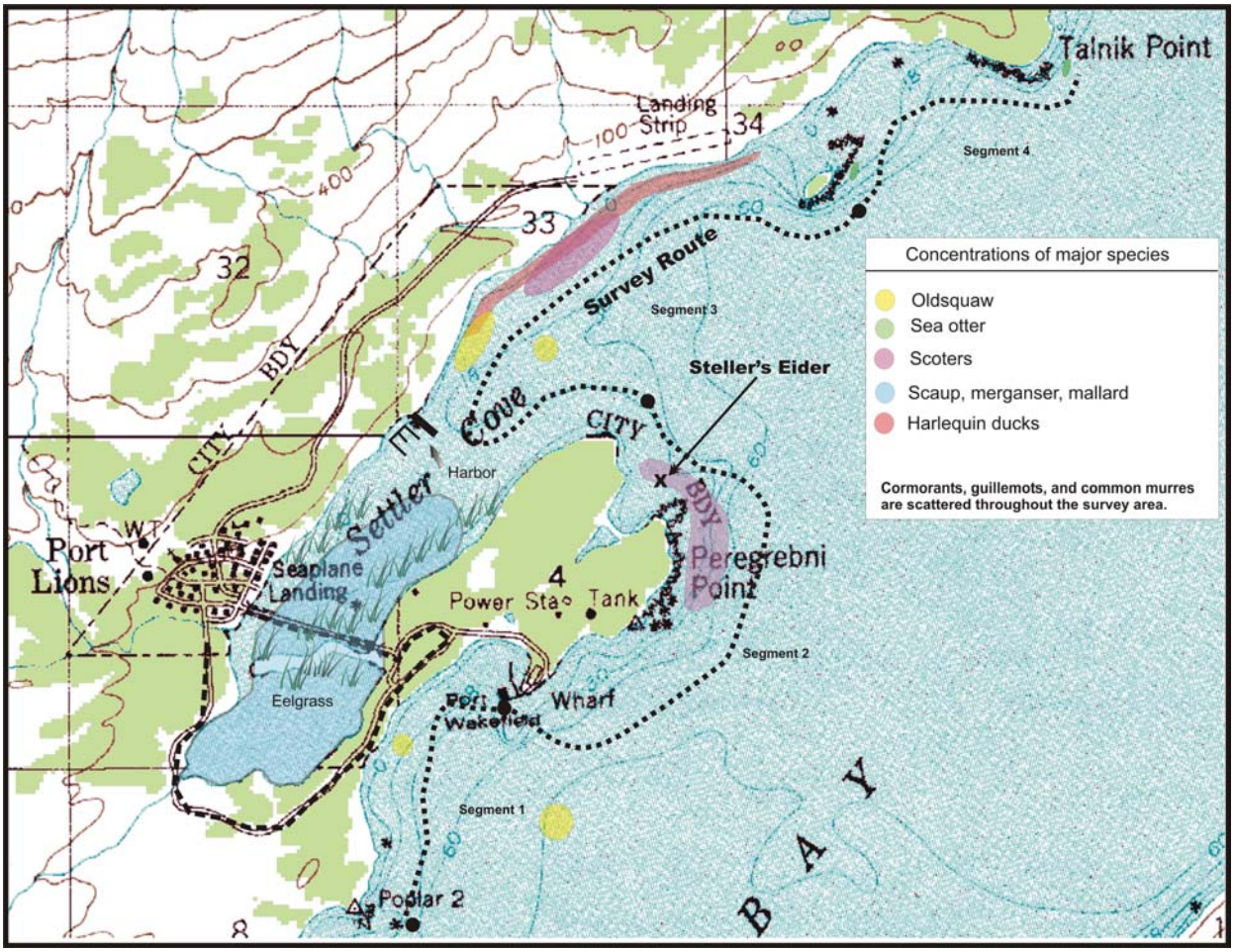


Figure 2. Locations of major species concentrations and the one Steller's eider seen during the March 5, 2002 sea duck survey at Port Lions, Alaska.

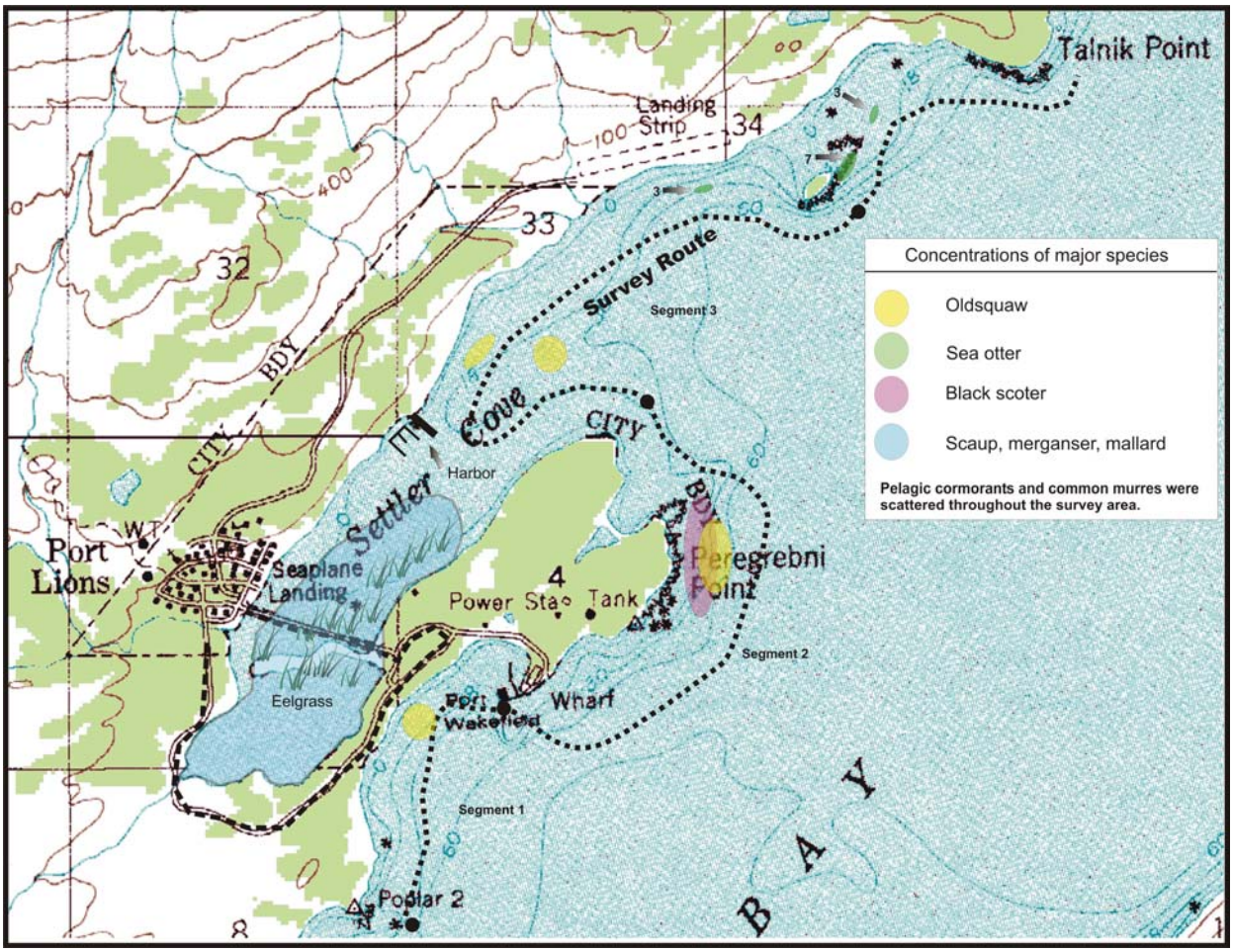


Figure 3. Locations of major species concentrations seen during the January 7, 2002 sea duck survey at Port Lions, Alaska. There were no Steller's eiders seen during the January survey.

Table 1. Bird counts by survey segment (figure 1) during Port Lions survey 2, March 5, 2002.

Species Surveyed	Segment #1	Segment #2	Segment #3	Segment #4	Settlers Cove	Total counted
Mallard	0	0	0	0	290	290
Scaup species	0	0	38	0	209	247
Oldsquaw	85	13	82	6	2	188
Black scoter	11	74	62	25	7	179
Cormorant species	25	25	71	14	31	166
Harlequin duck	9	10	71	35	3	128
Common goldeneye	10	1	11	13	47	82
Surf scoter	2	0	26	12	0	40
Red breasted merganser	0	0	8	0	31	39
Bufflehead duck	1	0	5	0	17	23
Pigeon guillemot	6	15	0	0	0	21
Greater scaup	2	2	8	0	1	13
Murrelet species	1	3	0	5	0	9
Murre species	0	2	0	3	0	5
Common merganser	0	0	0	0	4	4
Sea otter	0	0	0	4	0	4
Hair seal	0	0	2	0	0	2
Steller's eider	0	1	0	0	0	1
Red necked grebe	0	0	1	0	0	1
Total number of Individuals Counted 1,442						

APPENDIX 3

SURVEY METHODS

Scope of Work

Steller's Eider and Substrate Surveys
at
Point Lions, Alaska

Drafted January 30, 2002

1. **Project.** Improvements to the Port Lions, Alaska small boat harbor breakwater.

2. **Background.** The U.S. Army Corps of Engineers is studying potential improvements to the small boat harbor breakwater at Port Lions, Alaska. Improvements are expected to provide additional protection to the fleet and mooring docks from waves that enter the harbor under certain sea conditions. A team of two Corps biologists and one Fish and Wildlife Service observer will visit Port Lions on Tuesday, March 5, 2002, and conduct the second of two environmental surveys in the harbor area. The purpose of the surveys is to index the presence and abundance of a threatened sea duck, the Steller's eider, and a candidate marine mammal species, the sea otter, and video tape the substrate and its epibenthic fauna along designated transects that might be covered by a future breakwater.

3. **Methods**

a. Steller's eider survey.

i) The March 2002 survey will be conducted from a 26-foot cabin boat along a planned survey route (figure 1). The survey area includes the area on either side of the harbor entrance that might be disturbed by a fishing vessel entering or leaving the harbor. The biologists will note and record all species of ducks, sea ducks, sea birds, and marine mammals in the survey area.

ii) The survey will be conducted at speeds under 4 knots. Two Corps biologists experienced in sea duck surveys and identification (Larry Bartlett and Chris Hoffman) will conduct the survey. One biologist will cover the seaward side and one biologist will cover the shoreward side of the vessel. Distance from shore is expected to vary from about 200 to 400 yards. The biologist surveying the seaward side will cover the bay out to a point where sea ducks and other marine birds can be accurately identified with 8x42 power binoculars. This distance is expected to be about ¼ mile seaward of the boat. The expected survey distance from shore is about ½ mile.

iii) The starting point is optional depending on the time of day and position of the sun (if shining). The boat will operate to place the sun behind the observers to

facilitate visibility. On overcast days, the survey can be started from either end, but the segment numbers must be kept as pictured on figure 1 to correlate with the January 7, 2002 survey.

iv) The biologists should position themselves on the foredeck of the boat if weather conditions permit. Upon completion of the boat survey, the biologists will position a spotting scope about mid-point along the boardwalk (figure 1) and survey segment 5. Segment 5 extends on both sides of the boardwalk and seaward in Settler Cove to the harbor breakwater.

v) Observation of seaducks and seabirds will be recorded on tape and later transcribed into field notebooks, and the lead biologist will write a trip report upon return to District Headquarters. The trip report will be filed as a memorandum and a copy will be forwarded the Anchorage office of the U. S. Fish and Wildlife Service, Ecological Services.

b. Substrate videotape survey.

i) The second phase of the March 2002 survey will videotape the substrate community along several transects that might be covered by a future breakwater (figure 2). The March videotape survey is intended to be a reconnaissance survey that will determine the need for additional surveys, and assist with their planning. The exact number of transects videotaped may change in the field, but for planning purposes at least nine transects are expected to be videotaped. Transect range from shore to about 400 to 500 meters from shore.

ii) The survey boat is equipped with a color video monitoring and recording system. Transects will be videotaped in a shoreward to seaward direction. The boat will be positioned as close to shore as possible at the head of each transect surveyed. An initial GPS waypoint will be recorded next to shore and the transect will tracked seaward along a selected heading in the "go to" mode, to a final waypoint. Distance between the waypoints will be approximately 0.25 mile and calculated by the GPS. An estimate of depth along the transects will be recorded every 20 meters relative to the tide stage during the survey. Each transect will be recorded on a separate tape. Depth along the transects will have to be relative to a fixed object on shore as determined with a laser range finder.

iii) Species of fish, invertebrates, eelgrass, and algae observed on the tapes will be summarized and tabulated, but because the survey is a reconnaissance survey intended to indicate the need for more detailed surveys, no attempt will be made to quantify areas or density of sessile invertebrates, eelgrass or algae.

4. **Estimated Costs**

Item	Cost	Number [b]	Total
Airfare (COE)	510	2	1,020
Airfare (FWS)	510	1	510
Per Diem	134 [a]	6	804
COE Biologist's salary (2 biologists)	1,216 [a]	7	8,512
FWS Observer salary	500 [a]	3	1,500
38% FWS Overhead		---	764
Reporting and Administrative Incidentals [c]	2,000		2,000
		Grand Total	15,110

a. Cost/day.
b. Number of round-trip flights or work days for 1 survey.
c. Includes boat charter and miscellaneous transportation costs.

5. **Figures**

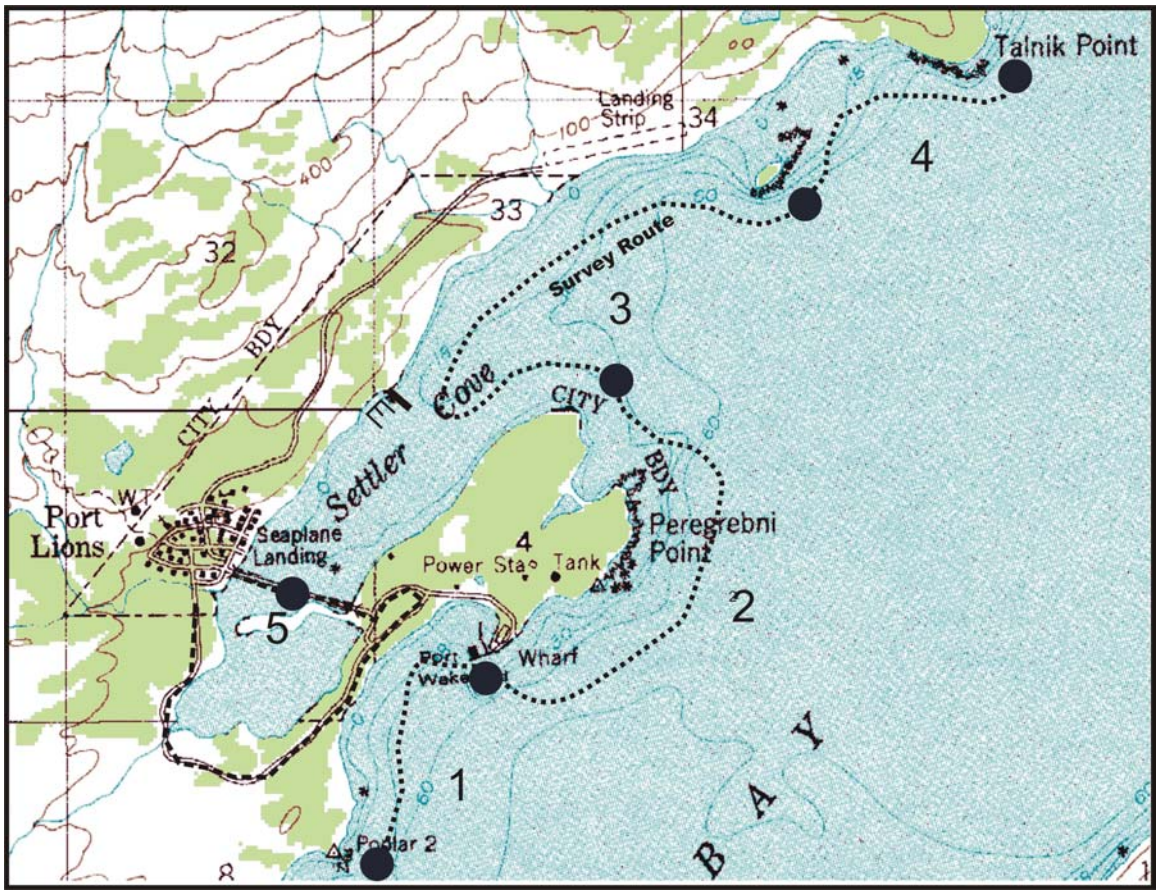


Figure 1. Steller's eider survey route and segment boundary points at Port Lions, Alaska.

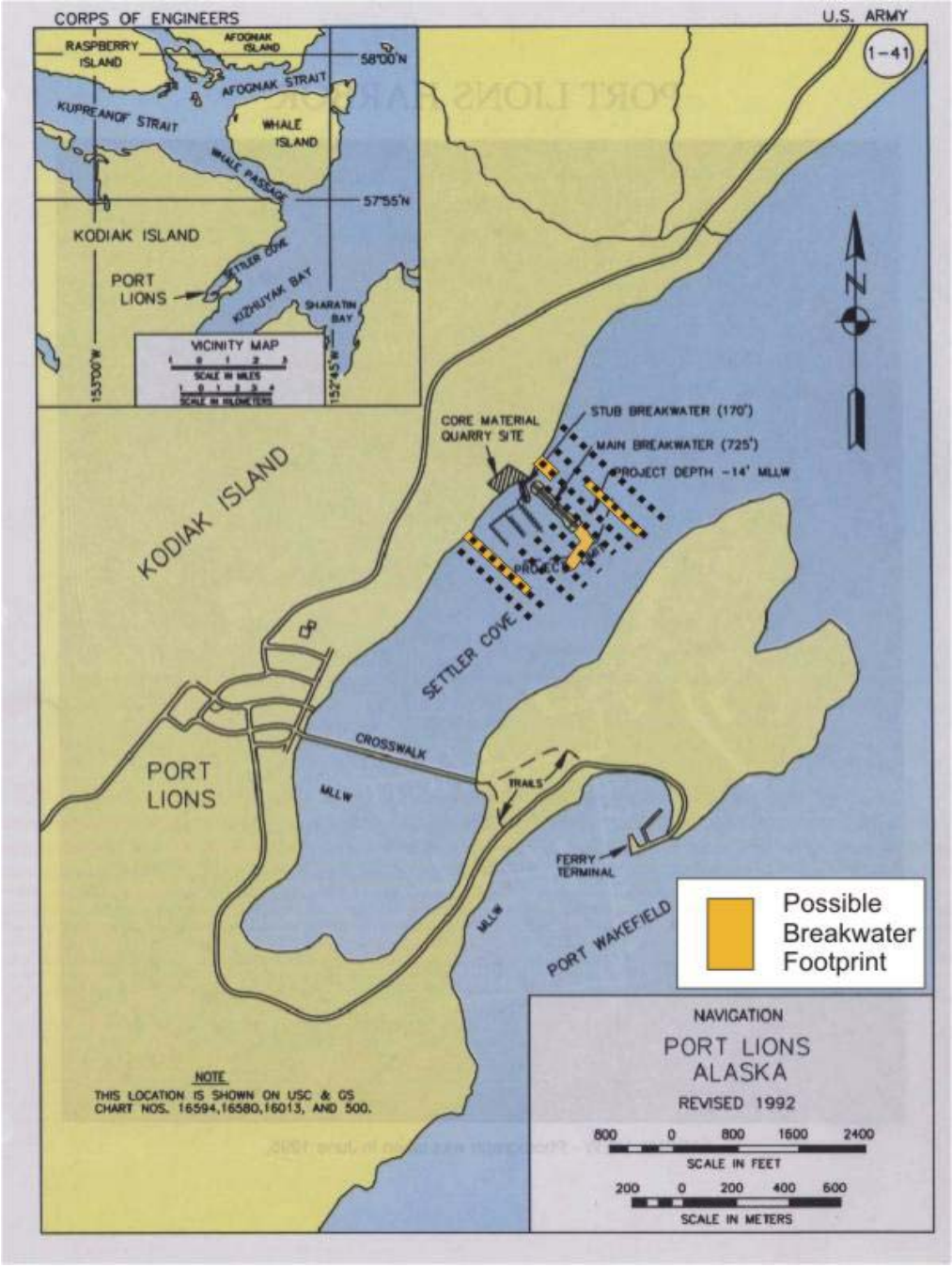


Figure 2. Approximate location and number of video transects that would be surveyed and taped during the March 2002 site visit to Port Lions harbor, Alaska.

APPENDIX 4

CORRESPONDENCE

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
P.O. Box 21668
Juneau, Alaska 99802-1668

January 29, 2003

Guy McConnell
U.S. Army Corps of Engineers
Alaska District
EN-CW-ER (Crayton)
P.O. Box 898
Anchorage, Alaska 99506-0898

Re: Port Lions, Alaska

Attn: Wayne Crayton

Dear Mr. McConnell:

Thank you for requesting compliance with applicable environmental laws for which the National Marine Fisheries Service (NMFS) administers in regard to your navigational harbor project in Akutan, Alaska. NMFS has reviewed your preliminary information and offers the following comments specific to section 7 of the Endangered Species Act (ESA), the Marine Mammal Protection Act (MMPA), and Essential Fish Habitat (EFH) provisions of the the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act).

Endangered Marine Mammal Species

NMFS is responsible for the administration of the ESA as it applies to certain cetaceans and pinnipeds in Alaska. These include seven species of whales (fin, right, humpback, blue, sperm, sei and bowhead), and western population of Steller sea lions.

Steller sea lion rookeries occur on Sugarloaf Island (Barren Islands), and the eastern shore of Marmot Island. Also, major Steller sea lion haulouts occur on Tonki Cape, Sealion Rocks, Cape Chiniak, Ugak Island, and Gull Point.

We do not expect these marine mammals to be affected by your proposed activity. However, we may need to discuss with your agency and contractor the placement of a trained marine mammal observer during construction activities. This would ensure that no harm occurs to endangered marine mammals during in-water construction activities.

Marine Mammal Species

Marine mammal species which associate with marine waters near Port Lions may include minke and killer whales, Dalls' and harbor porpoises, and harbor seals. However, harbor porpoises and harbor seals are more frequently observed in the bay. We do not expect the activity to affect any of these marine mammals.

Essential Fish Habitat (EFH)

EFH has been designated for certain life stages of marine fish under NMFS jurisdiction in the waters of Akutan Bay. For specific EFH information regarding your project area please visit our web site at:

http://www.fakr.noaa.gov/habitat/

A federal action that may adversely affect EFH must include an EFH assessment in either a separate document or be clearly referenced in a support document, such as an environmental assessment for the project that is prepared by the federal agency taking the action. An EFH assessment is outlined in 50 CFR Part 600.920. The contents of an assessment are likely included already in some form of your document. However, a clearly referenced EFH assessment will satisfy the requirements of the provisions regarding EFH within the administration of the Magnuson-Stevens Act. A federal action which does not adversely affect EFH will not require consultation with NMFS.

In-water construction activities and the placement of fill may have some impact to EFH. Therefore, we suggest any in-water activities be timed as to avoid out-migrating juvenile and returning adult salmonid migrations.

We hope this information is useful to you in fulfilling any requirements under section 7 of the ESA and EFH requirements under the Magnuson-Stevens Act.

Please direct any questions to Matthew P. Eagleton in our Anchorage field office at (907) 271-5006.

Sincerely,

For James W. Balsiger
Administrator, Alaska Region

cc: COE, ADEC, ADFG, ADGC, EPA, USFWS - Anchorage

Boyer, Lizette P POA

From: Brad Smith [Brad.Smith@noaa.gov]
Sent: Friday, March 04, 2005 3:32 PM
To: Boyer, Lizette P POA
Subject: Port Lions harbor

Re: our conversation today, NMFS does not see a need to provide an on-site marine mammal observer for the work described (i.e., not involving blasting or dredging). We concur with your recommendation to include wording within any applicable contract such that the operator/contractor would take appropriate measures to avoid injury or harassment if any marine mammal is observed during operations.

KOD D3 T 3130-1R COE,

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, ALASKA
P.O. BOX 898
ANCHORAGE, ALASKA 99506-0898

FEB 14 2003

REPLY TO
ATTENTION OF:

RECEIVED
FEB 19 2003
OHA

Environmental Resources Section

Ms. Judith Bittner
State Historic Preservation Officer
Office of History and Archaeology
550 West 7th Avenue, Suite 1310
Anchorage, AK 99501-3565

Dear Ms. Bittner:

The U.S. Army Corps of Engineers, Alaska District (Corps) is studying the feasibility of making improvements to the harbor at Port Lions in Settler Cove on northern Kodiak Island (SW¼SW¼SW¼, Section 33, T26S, R22W, KOD D-3, SM). The purpose of this letter is to notify you of a federal undertaking that has the potential to cause effects on historic properties and to seek your concurrence on an assessment that there are no historic properties affected by this project.

Settler Cove contains an existing small boat harbor that is used year-round by the community. The improvements at Settler Cove may include protecting the moorage space in the existing harbor by building breakwaters near shore. There are three preferred alternatives, which consist of various breakwater configurations outside the moorage area, none of which touch the shore. There will be a disposal area on shore, inland from the harbor in the cleared area visible on the enclosed aerial photographs. The disposal area is within an old quarry and is already disturbed.

Two sites are recorded by the Alaska Heritage Resources Survey (AHRS) within the town site of Port Lions. The Nativity of the Theotokos Chapel (KOD-00192) was built in 1965. Evidence of the earlier occupation includes petroglyphs (KOD-00365) north near the bridge of concentric circles and a fish. Elders reported that the remains of an earlier village lie under the modern town of Port Lions (AHRS).

A small precontact site (KOD-00452) is approximately ¾ of a mile northeast of the harbor site near the airport. The site is in the intertidal zone and consists of small chert flakes. Two sites are near Peregrebni Point. One has not been described (KOD-00236). KOD-00051 is a Late Kachemak, pre-contact village site. Another Kachemak tradition site (KOD-00050) associated with historic period garden plots is near Port Wakefield. South of this is a shell bearing midden site (KOD-00049) with historic period garden plot features on the surface.

None of the sites are within the area of potential effect and will not be affected by access, or activities associated with the construction at the site. The harbor itself was built in 1981 and is

not of exceptional importance. Therefore, no historic properties are affected by this harbor improvement in Settler Cove.

If you have any questions about the project or the assessment of effects, please call or e-mail Diane Hanson (753-2631, diane.k.hanson@poa02.usace.army.mil)

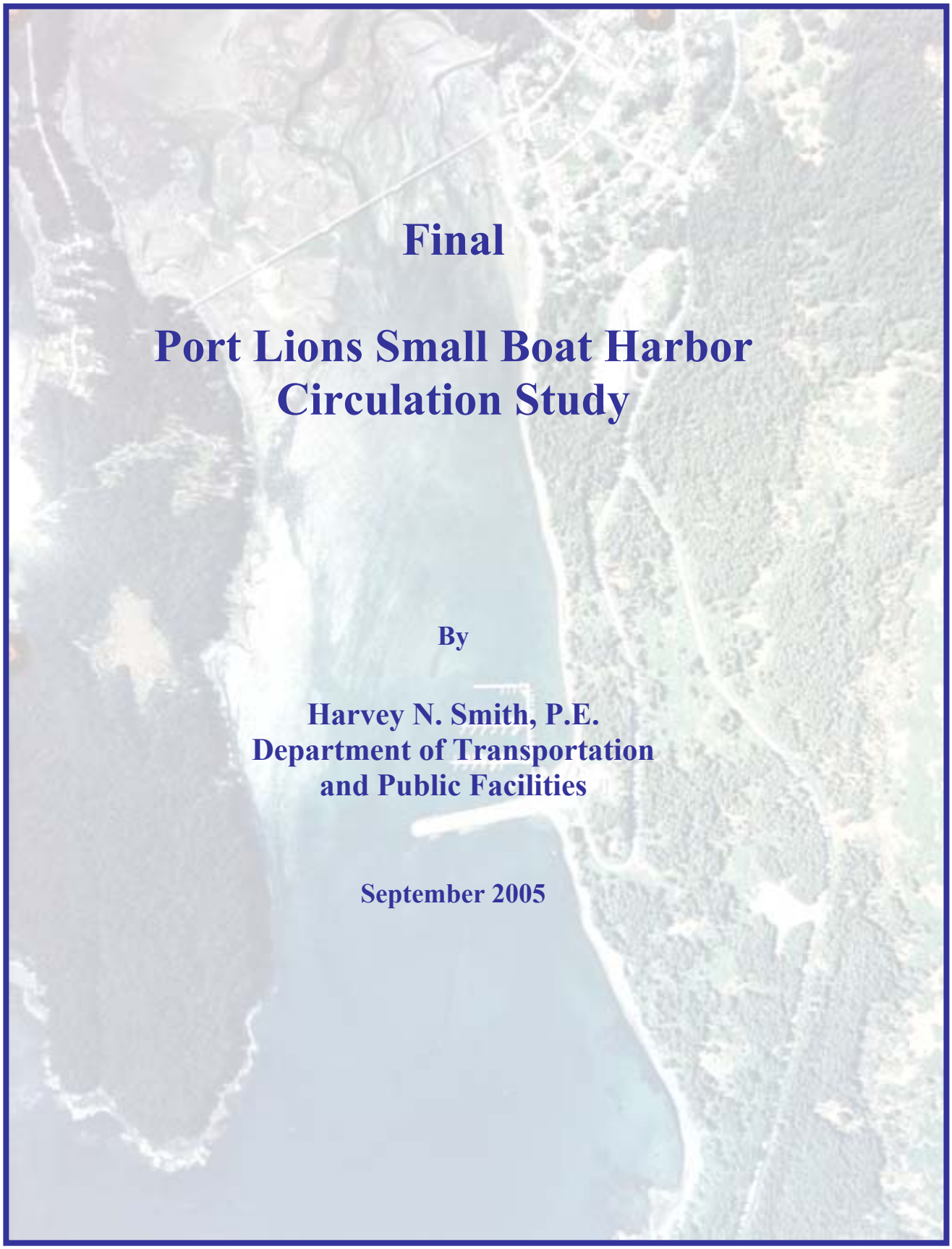
Sincerely,

Guy R. McConnell

Guy R. McConnell
Chief, Environmental Resources Section

Enclosures

No Historic Properties Affected
Alaska State Historic Preservation Officer
Date: 3-12-03
File No.: 3130-1R COE SL



Final

Port Lions Small Boat Harbor Circulation Study

By

Harvey N. Smith, P.E.
Department of Transportation
and Public Facilities

September 2005

INTRODUCTION

This report, originally submitted for review December 2003, addresses the circulation and water exchange for the proposed improvements to the Port Lions Small Boat Harbor. The first part of the report discusses the general aspects of tidal circulation in small boat harbors based on the guidelines in "Effects Of Planform Geometry on Tidal Flushing and Mixing in Marinas" Nece et. al. and was written prior to numerical modeling. The last part of the report, beginning on page 6, is a re-evaluation based on numerical modeling with the Princeton Ocean Model. The summary discusses the findings and compares the methods of analysis.

The flushing of the proposed improvements must satisfy the requirements for the 401 Clean Water Certificate issued by the Department of Environmental Conservation. The standard for evaluating water quality is based primarily on relative performance between alternatives. Although it is recommended that construction projects do not degrade the water quality below existing levels, this is often not possible; therefore, the objective is to identify the plan that has the best circulation and flushing while still satisfying the requirements for safety, performance, and operation of the harbor.

The factors that are considered in the evaluation of hydraulic exchange and circulation are discussed below.

MEASURES OF PERFORMANCE

Exchange Coefficient (E)

Exchange Coefficient is the term that is most commonly used as a measurement for how well a basin flushes. It is defined as the percent of water that is exchanged within the basin on each tidal cycle. Although a gross average for the total basin is often used for comparing alternatives, it is more appropriate to look at the spatial distribution of exchange throughout the basin.

Mixing Coefficient (S)

The Standard Deviation of exchange coefficients from locations throughout the basin is an indication of how well the water has mixed. A low value shows good uniform mixing with few stagnation zones. A high value generally indicates stagnation zones.

A single expression that may be the best indicator of overall flushing is the average exchange minus one standard deviation (E-S).

Exchange Efficiency (e)

This is the best measure of performance when comparing alternatives. Exchange Efficiency is the ratio of actual (measured) exchange divided by the Tidal Prism Ratio. The efficiency will be 100 percent If the ambient water mixes completely with the basin water on each tidal cycle. This is only a theoretical possibility since the hydraulic properties of water limit the amount of physical mixing. However, efficiency can actually exceed 100% if, during the flood, the clean ambient water circulates into the basin and displaces the basin water on the ebb. On the other hand, if much of the same water that enters on the flood is discharged on the ebb efficiencies can drop to 30% or less.

PARAMETERS AFFECTING PERFORMANCE

The parameters that most affect flushing in closed tidal basins are 1) Tidal Prism Ratio (TPR), 2) Planform Aspect Ratio (AR) and 3) ratio of the basin area to the cross-section of the entrance channel(s) (A/a). Rounding the basin to better facilitate the formation of a circulation gyre is also recommended. These parameters do not apply to basins with multiple entrances and flow through conditions as may be found on rivers or areas where strong longshore tidal currents dominate.

Tidal Prism Ratio (TPR)

The tidal prism ratio is defined as the volume of water that floods into a basin from low tide to high tide (tidal prism) divided by the total volume at high tide. It is a function of local tide conditions and basin depth. Shallow basins with high tidal ranges will have the greatest and most favorable tidal prism ratios. The Port lions mooring basin has rather average tides and water depths, which result in a TPR of about .34. This means that 34% of the basin water would be exchanged on every tidal cycle if the ambient water were completely mixed (efficiency of 100%) with the basin water during the tidal exchange.

Generally, the TPR can be improved by making the basin shallower; however, this is limited by the drafts of the design vessels.

For Port Lions there is some benefit to the TPR from the mildly sloping beach along the shoreline; however, this is offset by some of the deeper pockets along the inside of the existing breakwater.

Aspect Ratio (AR)

The Port Lions aspect ratio is roughly 1.2 to 1. This would be considered very good. Basins with an AR greater than 2 to 1 can begin to have reduced flushing and basins with AR's greater than 3 to 1 are discouraged. The alt 3b basin has avoided square corners, which will reduce the occurrence of stagnation zones.

Ratio of Basin Area to Channel Cross-Section (A/a)

The A/a ratio is one of the more important parameters for estimating convective diffusion in tidally driven circulation. This ratio determines the velocity, momentum, and energy available to drive the convective circulation cells. This can be thought of as the "garden hose effect" where restricting the flow creates a much higher energy jet for the same discharge. A large A/a is preferred and can be increased by enlarging the surface area of the basin or reducing the cross section of the entrance channel (s). The basin area (A) is generally determined by physical, economic, or environmental constraints. The channel cross-section (a), including both width and depth, is governed by safe navigation for the design vessels. The cross section of a breach is added to the "a" term.

Longshore Currents

If longshore currents are weak and the tides are large, the tidal prism drives the circulation. If the tidal range is small and the longshore current is strong a "flow through" effect may control the flushing.

Because of the double entrance and strong longshore currents, it cannot be determined which hydraulic mechanism controls the exchange and mixing at Port Lions without a more sophisticated model.

Breach(es)

The breach in the Port Lions Alternative 3b breakwater would normally reduce the water quality and exchange within the basin if circulation were driven by the tidal prism. Since a current exists the breach may create a flow-through effect that could actually improve the exchange.

Other Considerations

Other factors can effect circulation besides those discussed above. These include 1) Re-entrainment, 2) Wind, 3) Stratification, and 4) Mechanical Enhancement

Re-entrainment

When basin water is discharged during the tidal ebb, it is mixed with the outside ambient water and is usually carried away from the basin so it isn't re-entrained during the following flood. However, this may not be the case if the outside current is small, or the discharge region is confined.

Wind

The effects of wind are normally beneficial but are usually not included when tides and currents dominate exchange. It is important when considering winds to include the effects of vessels and floats on the transfer of shear stresses between the wind and water. Most of the energy transfer is along the fairways or navigation channels.

Stratification

It appears there may be fresh water entering the basin. Although this may lead to excessive icing during winter months it may benefit the flushing during the times when juvenile fish may be taking up residence. If the basin has a layer of fresh water overlying seawater the ambient flood currents will move underneath similar to the salt wedge that may be found in estuaries. This effectively increases the A/a ratio by reducing the effective channel cross-section. The increased velocity and momentum will carry the ambient water farther into the basin. During the ebb the full water column, including the upper fresh water layers, will be discharged.

Mechanical Devices

In areas of impaired dissolved oxygen, it is possible to use some type of mechanical system to enhance circulation or aerate the water. The Port lions tides, naturally cool water, and longshore currents should be sufficient to preclude the need for mechanical enhancements.

Summary of Numerical Model Study and Evaluation of Alternatives

Based on the above discussions of water quality and circulation it could not be determined whether the proposed Port Lions boat harbor would be influenced more by the tidal prism effects or by the longshore currents. For this reason DEC directed the Department of Transportation and Public Facilities to re-evaluate the flushing using a more sophisticated numerical analysis. The methodology and results are discussed below.

Model and Methodology

The study used the Princeton Ocean Model (POM) on a 5-meter grid and 0.3-second time interval. The model was run for the average tide condition with Range = 7.3 ft and Mean Tide Level = 4.8 ft. The average computer run time was roughly 16 hours to simulate four twelve-hour tidal cycles.
The first attempts explored modeling in a three dimensional (3-D) mode with multiple layers over the depth; this led to instabilities in the shallow upper reaches of Settlers Cove. Therefore, the remaining work was in a two dimensional (2-D) mode. This proved to be successful and is consistent with standard modeling practices.

In the 3-D mode, the diffusivity constant is automatically calculated; it is entered manually in the 2-D mode. The model was run with a low diffusivity to enhance contrast and better identify areas of low exchange. Consequently, the actual exchange coefficients are slightly more conservative, but relative performance of the alternatives is representative.

The modeling procedure followed standards set by Nece et.al. for evaluating exchange and mixing in boat harbors. Each alternative was run for four cycles, starting and ending at low tide. The water level was simulated with a sinusoidal tide using the average depth and range. The initial condition assumed a 100% concentration of a constituent throughout the basin. At the end of 4 cycles, the concentrations were converted to exchange coefficients using the expression:

$$E = 1-R \quad \text{where} \quad R = (Cn/Co)^{1/n}$$

E = Exchange coefficient (percent of water exchanged on each tidal cycle)
R = Retention coefficient (percent of water retained on each tidal cycle)
Cn = Concentration after n cycles
Co = Initial concentration
n = Number of cycles (usually 4)

These values, along with velocity vectors, are computed implicitly three times per second while the model is running. At predetermined intervals, the values are stored for visual animation playback. In this case the interval was 15 minutes (real time).

Results

The computer runs are summarized in the following figures, which show the spatial distribution of exchange coefficients at the cycle 4, low condition.

As-is

It was originally believed that the "as-is" condition would clean out more quickly than it does. The clockwise gyre that was anticipated during the flood phase of the tide was not strong enough to develop the angular momentum necessary for efficient flushing. Most of the basin water is either displaced into the corner near the existing breach or along the shoreline farther into Settlers Cove.

As the tide ebbs, much of the basin water that flows along the shoreline is re-entrained back into the area of the basin. Only a small percentage is displaced outside of Settlers Cove. Figure 1 shows the exchange coefficients at the end of 4 cycles. Much of the basin area still has high concentrations. However, the area along the outside of the mooring basin shows to have very clean water. This is primarily due to the free boundary and lack of breakwater. (Note: The exchange is calculated using the same template as the 3b basin).

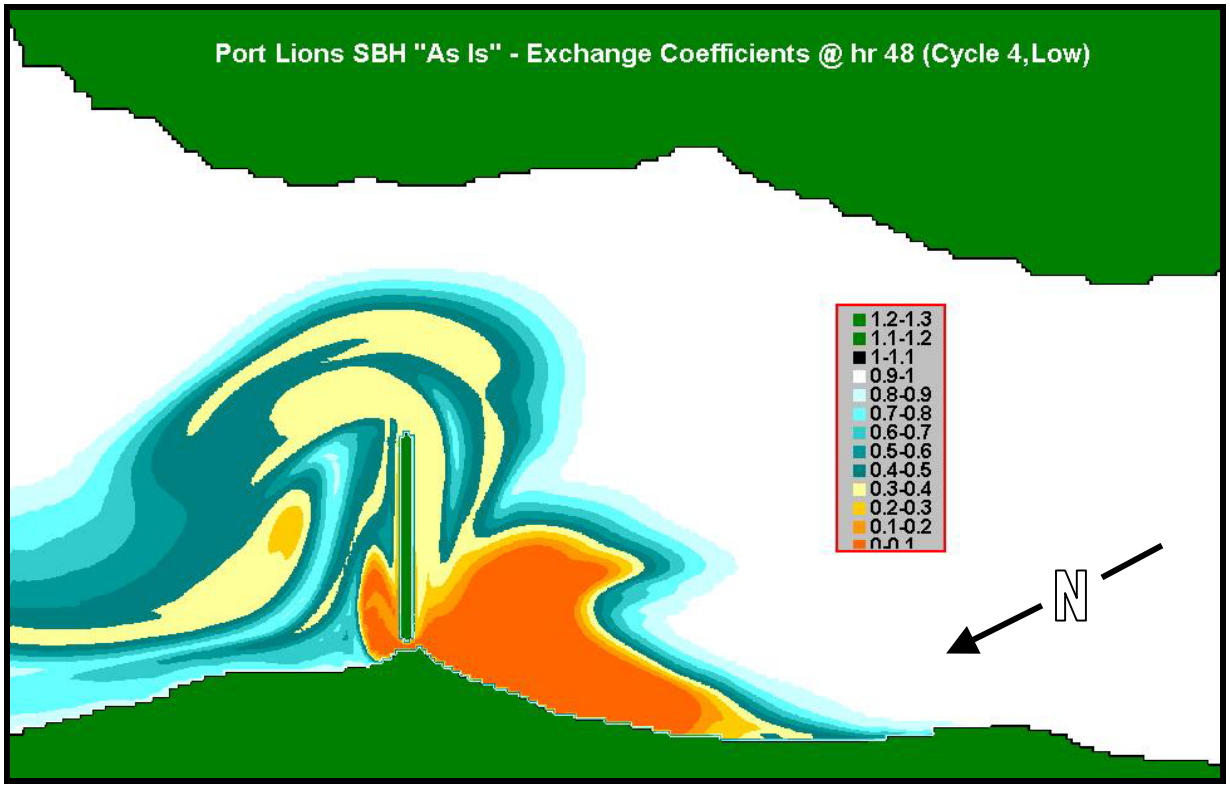


Figure 1. Exchange coefficient distribution for "As-is" condition after 4 cycles

Alternative 3b

Alternative 3b (Figure 2) show more uniform concentrations and smaller stagnation zones than the "as is" condition. Flow characteristics of alternative 3b show a strong influence from tidal currents and the breach formed by the new breakwater. This results in a "flow-through" exchange, rather than one based on the tidal prism ratio (TPR).

During the flood phase of the tide, there is a strong flow through the main channel into the basin and a somewhat lesser flow out of the breach. Flow out of the breach tends to move along the shoreline into Settlers Cove during the flood and is re-entrained into the basin during the ebb similar to the "as-is" condition. This high re-entrainment results in a lower exchange than that found in a constant "flow-through" condition, such as on a river.

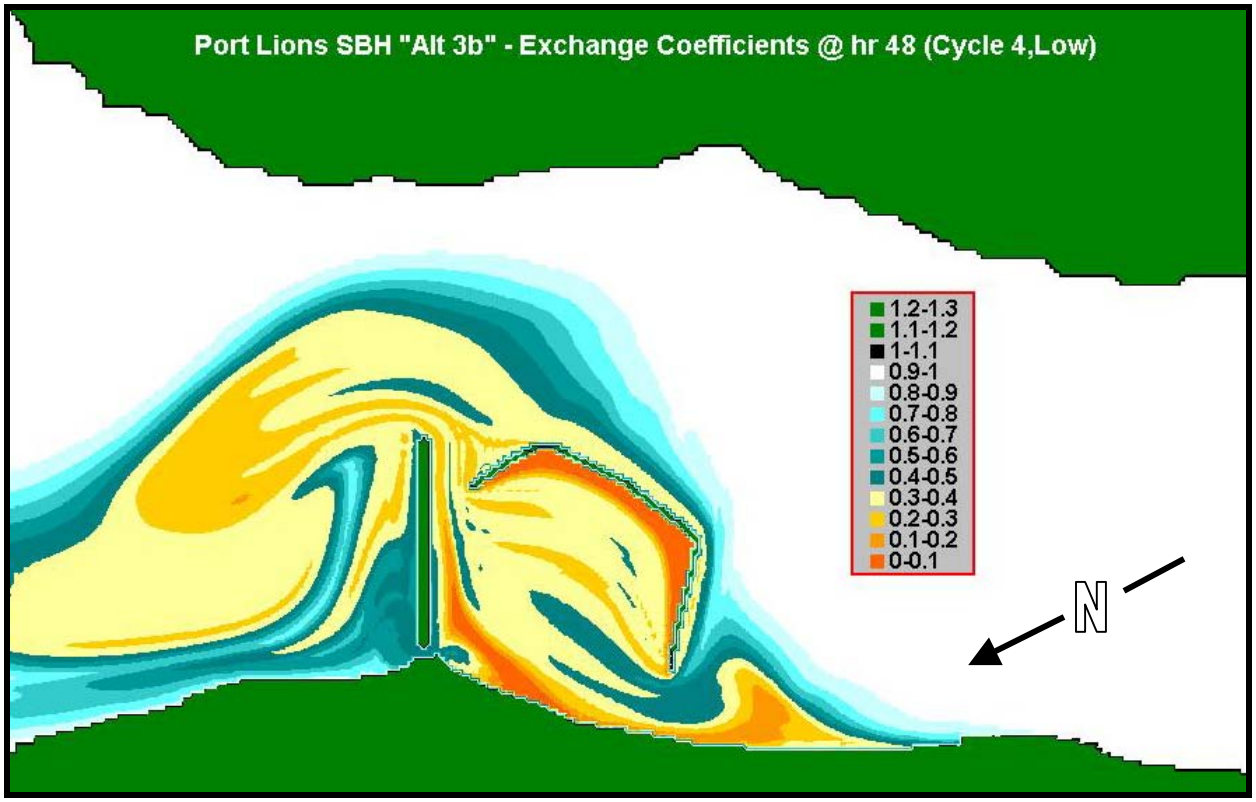


Figure 2. Exchange coefficient distribution for "Alt 3b" after 4 cycles

Summary

Three values are considered in determining the comparative water quality; these include: average exchange coefficient (E), mixing coefficient (S), and a combined Flushing term (E-S).

Both the "as-is" condition and the proposed alternative "3b" have average exchange coefficients (E) of 0.30. This average value is generally considered acceptable. The mixing coefficient (S), which is the standard deviation of the exchange coefficients, is poor for the "as-is" condition with a value of 0.30; Alt. 3b has a much better S value of 0.14.

A standard criteria developed by the Washington Department of Fisheries recommends that the average exchange should be at least .30 with no more than 5% percent of the basin having exchange values lower than 0.15. (Note: this criterion was developed for physical models and should not be applied directly to numerical models. The relative values are, however, representative of the comparable mixing.)

There are no specific criteria for an "acceptable" level of exchange in Alaska Harbors so relative performance is normally the best measure of acceptability. This has also been the most common method of evaluating alternative designs throughout the Northwest.

If we look at relative performance the "as-is" condition has 36% of the basin with exchange below 0.15; for alternative "3b" only 14% percent of the basin is below 0.15.

The combined flushing term (E-S) which factors in both exchange and mixing, can also be compared. The F value is -0.1 for "as-is" and 0.14 for 3b. Values of E-S greater than 0.1 normally show a fair amount of exchange.

Figure 3., which plots the frequency of occurrence of exchange coefficients throughout the basin, shows the relationship between the values of E and S. The ideal shape of the frequency distribution curve is a narrow bandwidth with the mode (peak) as far to the right as possible. These curves are often bi-modal. Secondary peaks less than 0.15 may indicate stagnation zones and warrant attention.

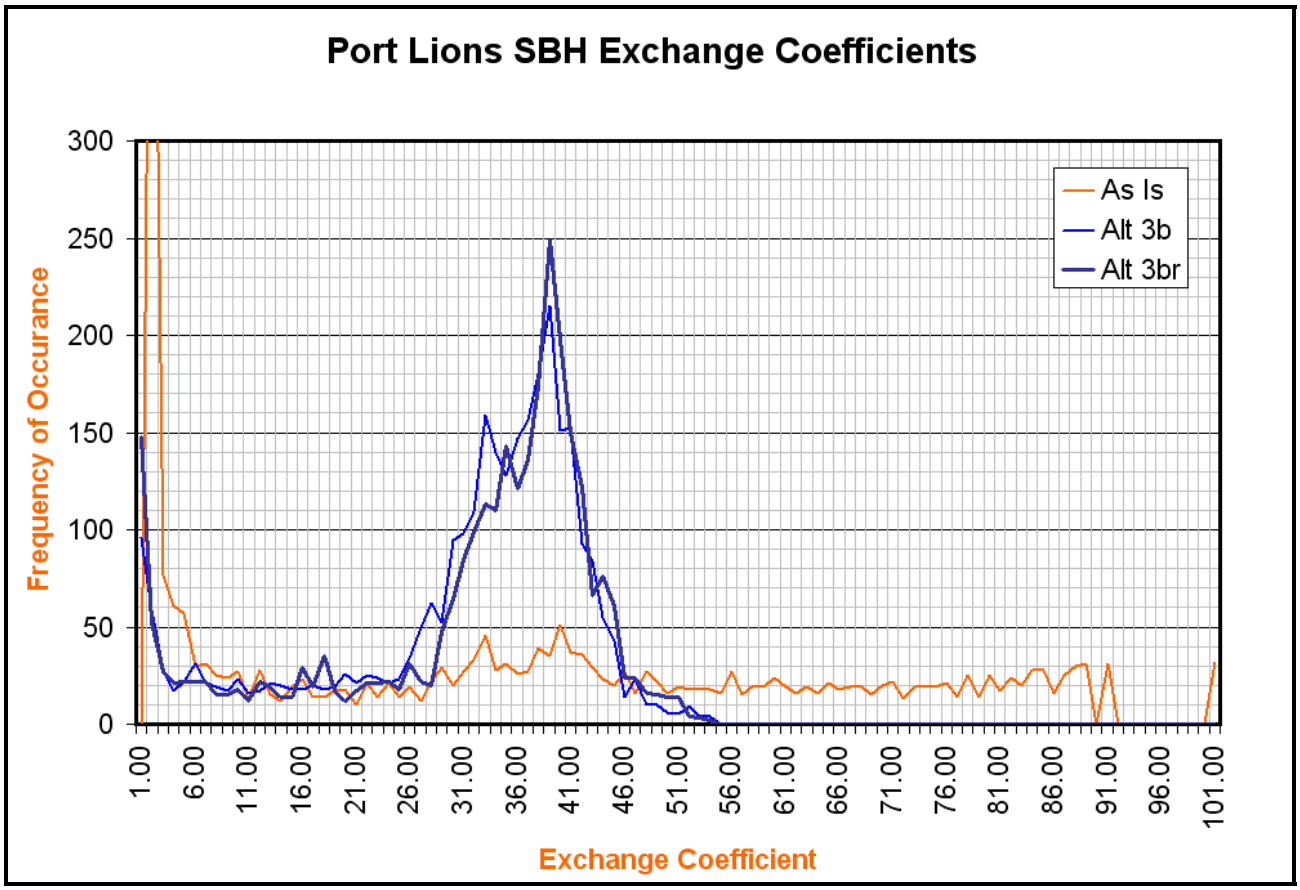


Figure 3. Frequency distribution plot of exchange coefficients

The "as-is" condition and alternative 3b are similar in terms of exchange. However, alternative 3b appears to be much better based on relative mixing and overall flushing. Apparently, the existing condition does not generate a strong enough gyre to rotate clean ambient water in and displace basin water out into the channel. Alternative 3b, however, appears to work as a steering vane, so that more of the flow is carried through the basin area.

The "as-is" condition shows a very flat curve over the full range of exchange coefficients with a strong modal peak near zero. Although the average exchange is similar to that of 3b, the flat curve indicates very poor mixing and the modal value near zero indicates a stagnation zone. (Note: The term "stagnation" should be used carefully here since much of the basin water is displaced by clean water at some point during the tidal cycle.)

Alternative 3b shows a much more idealized curve with a strong modal tendency for exchange of about 0.36. It also shows a weaker modal tendency near zero.